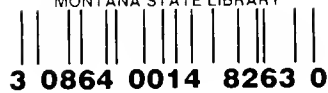


S
333.95416
F2TWIS
1980

Prepared : [illegible]
[illegible]

MONTANA STATE LIBRARY



3 0864 0014 8263 0

TABLE OF CONTENTS

	Page
List of Figures.....	v
List of Tables.....	vi
Abstract.....	xiii
Introduction.....	1
Procedures.....	2
Game Mammals.....	2
Game Birds.....	2
Songbirds.....	2
Raptors.....	3
Non-game Mammals.....	3
Amphibians and Reptiles.....	3
Description of Study Areas.....	3
Sweeney-Snyder.....	3
Greenleaf-Miller.....	4
Foster Creek.....	4
Sand Creek.....	8
Birney.....	8
Kirby.....	8
Tongue River Dam.....	12
Results and Discussion.....	12
Sweeney-Snyder.....	12
Mule Deer.....	12
Population characteristics.....	12
Vegetation type usage.....	12
Activity.....	14
Use of topography.....	14
Use of exposure.....	16
Use of slope.....	16
Antelope.....	17
Population characteristics.....	17
Vegetation type usage.....	17
Activity.....	17
Use of topography.....	18
Use of exposure.....	18
Use of slope.....	18
Sharp-tailed Grouse.....	21
Sage Grouse.....	21
Ring-necked Pheasant.....	21
Merriam's Turkey.....	21
Waterfowl.....	21
Songbirds and Raptors.....	21
Non-game Mammals.....	24
Amphibians and Reptiles.....	24
Greenleaf-Miller.....	25
Mule Deer.....	25
Population characteristics.....	25
Vegetation type usage.....	25
Activity.....	25
Use of topography.....	25
Use of exposure.....	25
Use of slope.....	28

TABLE OF CONTENTS

	Page
Antelope.....	28
Population characteristics.....	28
Vegetation type usage.....	28
Activity.....	30
Use of topography.....	30
Use of exposure.....	30
Use of slope.....	31
Sharp-tailed Grouse.....	31
Ring-necked Pheasant.....	32
Other Game Species.....	32
Songbirds and Raptors.....	32
Non-game Mammals.....	34
Amphibians and Reptiles.....	34
Foster Creek.....	37
Mule Deer.....	37
Population characteristics.....	37
Vegetation type usage.....	38
Activity.....	38
Use of topography.....	39
Use of exposure.....	39
Use of slope.....	39
White-tailed Deer.....	40
Antelope.....	40
Population characteristics.....	40
Vegetation type usage.....	41
Activity.....	41
Use of topography.....	42
Use of exposure.....	42
Use of slope.....	42
Sharp-tailed Grouse.....	44
Sage Grouse.....	44
Other Game Birds.....	44
Waterfowl.....	44
Songbirds and Raptors.....	45
Non-game Mammals.....	47
Amphibians and Reptiles.....	47
Sand Creek.....	47
Mule Deer.....	47
Population characteristics.....	47
Vegetation type usage.....	51
Activity.....	51
Use of topography.....	51
Use of exposure.....	51
Use of slope.....	51
White-tailed deer.....	51
Antelope.....	51
Population characteristics.....	51
Vegetation type usage.....	51
Activity.....	54

TABLE OF CONTENTS

	Page
Use of topography.....	54
Use of exposure.....	54
Use of slope.....	54
Sharp-tailed Grouse.....	57
Sage Grouse.....	57
Other Game Birds.....	57
Songbirds and Raptors.....	57
Non-Game Mammals.....	59
Amphibians and Reptiles.....	60
Birney.....	61
Mule Deer.....	61
Population characteristics.....	61
Use of vegetation	61
Activity.....	61
Use of topography.....	63
Use of slope.....	63
White-tailed Deer.....	64
Antelope.....	64
Sharp-tailed Grouse.....	65
Ring-necked Pheasant.....	65
Turkey.....	65
Waterfowl.....	65
Songbirds and Raptors.....	67
Non-Game Mammals.....	67
Kirby.....	67
Mule Deer.....	67
Population characteristics.....	67
Use of vegetation.....	69
Activity.....	69
Use of topography.....	69
Use of slope.....	69
Use of exposure.....	69
Whitetail Deer.....	70
Antelope.....	70
Population characteristics.....	70
Use of vegetation.....	70
Activity.....	70
Use of topography.....	70
Use of slope.....	70
Use of exposure.....	70
Sharp-tailed Grouse.....	73
Turkey.....	73
Ring-necked Pheasant.....	73
Waterfowl.....	74
Songbirds and Raptors.....	74
Non-game Mammals.....	76
Tongue River Dam.....	77
Mule Deer.....	77
Population characteristics.....	77
Use of vegetation.....	78

TABLE OF CONTENTS

	Page
Activity.....	78
Use of topography.....	78
Use of slope.....	78
Use of exposure.....	78
Whitetail Deer.....	78
Antelope.....	78
Population characteristics.....	78
Use of vegetation.....	79
Activity.....	79
Use of topography.....	79
Use of slope.....	79
Use of exposure.....	79
Upland Game Birds.....	79
Waterfowl.....	79
Songbirds and Raptors.....	80
Non-Game Mammals.....	80
Literature Cited.....	84

List of Figures

Number	Page
1. Sweeney-Snyder study area.....	4
2. Greenleaf-Miller study area.....	6
3. Foster Creek study area.....	7
4. Sand Creek study area.....	9
5. Birney study area.....	10
6. Kirby study area.....	11
7. Tongue River Dam study area.....	13

LIST OF TABLES

Number	Page
1. Average group size of mule deer in the Sweeney-Snyder and Greenleaf-Miller study area.....	14
2. Mule deer, antelope and coyote aerial observations per hour in the Sweeney-Snyder study area.....	14
3. Seasonal use of vegetation types by mule deer in the Sweeney-Snyder study area.....	15
4. Seasonal activity of mule deer in the Sweeney-Snyder study area.....	15
5. Seasonal use of topography by mule deer in the Sweeney-Snyder study area.....	16
6. Seasonal use of exposures by mule deer in the Sweeney-Snyder study area.....	16
7. Seasonal use of slope by mule deer in the Sweeney-Snyder study area.....	17
8. Average group size of antelope in the Sweeney-Snyder and Greenleaf-Miller study areas.....	18
9. Antelope population characteristics in the Sweeney-Snyder study area.....	18
10. Seasonal use of vegetation types by antelope in the Sweeney-Snyder study area.....	19
11. Seasonal activity of antelope in the Sweeney-Snyder study area.....	19
12. Seasonal use of topography by antelope in the Sweeney-Snyder study area.....	20
13. Seasonal use of exposure by antelope in the Sweeney-Snyder study area.....	20
14. Seasonal use of slope by antelope in the Sweeney-Snyder study area.....	20
15. Sharp-tailed grouse dancing grounds in the Sweeney-Snyder study area and number of males attending.....	22
16. Sage grouse strutting grounds in the Sweeney-Snyder study area and number of males attending.....	22
17. Bird species observed in the Sweeney-Snyder study area.	22

LIST OF TABLES

Number	Page
18. Bird species composition and frequency of occurrence from the three Sweeney-Snyder breeding bird surveys...	23
19. Mammals observed on the Sweeney-Snyder study area.....	24
20. Results of small mammal trapping on the Sweeney-Snyder study area during the summer season.....	24
21. Amphibians and reptiles observed on the Sweeney-Snyder study area.....	25
22. Mule deer, antelope and coyote aerial observations per hour in the Greenleaf-Miller study area.....	26
23. Seasonal use of vegetation types by mule deer in the Greenleaf-Miller study area.....	26
24. Seasonal activity of mule deer in the Greenleaf-Miller study area.....	27
25. Seasonal use of topography by mule deer in the Greenleaf-Miller study area.....	27
26. Seasonal use of exposure by mule deer in the Greenleaf-Miller study area.....	27
27. Seasonal use of slope by mule deer in the Greenleaf-Miller study area.....	28
28. Antelope population characteristics in the Greenleaf-Miller study area.....	29
29. Seasonal use of vegetation types by antelope in the Greenleaf-Miller study area.....	29
30. Seasonal activity of antelope in the Greenleaf-Miller study area.....	30
31. Seasonal use of topography by antelope in the Greenleaf-Miller study area.....	30
32. Seasonal use of exposure by antelope in the Greenleaf-Miller study area.....	31
33. Seasonal use slope by antelope in the Greenleaf-Miller study area.....	31
34. Sharp-tailed grouse dancing grounds in the Greenleaf-Miller study area and number of males attending.....	32

LIST OF TABLES

Number		Page
35.	Bird species observed on the Greenleaf-Miller study area.....	33
36.	Bird species composition and frequency of occurrence from three Greenleaf-Miller breeding bird surveys.....	35
37.	Mammals observed on the Greenleaf-Miller study area...	36
38.	Results of small mammal trapping on the Greenleaf-Miller study area during the summer season.....	36
39.	Amphibians and reptiles observed in the Greenleaf-Miller study area.....	36
40.	Mean group size for mule deer on the Foster Creek and Sand Creek study areas.....	37
41.	Mule deer, antelope and coyote aerial observations per hour on the Foster Creek study area.....	37
42.	Seasonal use of vegetation types by mule deer on the Foster Creek study area.....	38
43.	Seasonal activity of mule deer on the Foster Creek study area....	39
44.	Seasonal use of topography by mule deer on the Foster Creek study area.....	39
45.	Seasonal use of exposure by mule deer on the Foster Creek study area.....	40
46.	Seasonal use of slope by mule deer on the Foster Creek study area.....	40
47.	Mean group size for antelope on the Foster Creek and Sand Creek study areas.....	41
48.	Antelope population structure on the Foster Creek study area, 1980.....	41
49.	Seasonal use of vegetation types by antelope on the Foster Creek study area.....	42
50.	Seasonal activity of antelope on the Foster Creek study area.....	43
51.	Seasonal use of topography by antelope on the Foster Creek study area.....	43

LIST OF TABLES

Number		Page
52.	Seasonal use of exposure by antelope on the Foster Creek study area.....	43
53.	Seasonal use of slope by antelope on the Foster Creek study area.....	44
54.	Locations of sharp-tailed grouse dancing grounds on the Foster Creek study area and number of males attending, 1980.....	45
55.	Birds observed on the Foster Creek study area.....	46
56.	Bird species composition from three runs of the bird inventory route on the Foster Creek study area, spring 1980.....	48
57.	Mammals observed on the Foster Creek study area.....	49
58.	Results of small mammal trapping on the Foster Creek study area, summer 1980.....	49
59.	Prairie dog town locations and survey results, Foster Creek study area.....	50
60.	Amphibians and reptiles observed on the Foster Creek study area.....	50
61.	Mule deer, antelope and coyote aerial observations per hour on the Sand Creek study area.....	52
62.	Seasonal use of vegetation types by mule deer on the Sand Creek study area.....	52
63.	Seasonal activity of mule deer on the Sand Creek study area.....	53
64.	Seasonal use of topography by mule deer on the Sand Creek study area.....	53
65.	Seasonal use of exposure by mule deer on the Sand Creek study area.....	53
66.	Seasonal use of slope by mule deer on the Sand Creek study area.....	54
67.	Antelope population structure on the Sand Creek study area, 1980.....	54
68.	Seasonal use of vegetation types by antelope on the Sand Creek study area.....	55

LIST OF TABLES

Number		Page
69.	Seasonal activity of antelope on the Sand Creek study area.....	55
70.	Seasonal use of topography by antelope on the Sand Creek study area.....	56
71.	Seasonal use of exposure by antelope on the Sand Creek study area.....	56
72.	Seasonal use of slope by antelope on the Sand Creek study area.....	56
73.	Locations of sharp-tailed grouse dancing grounds on the Sand Creek study area and number of males attending, 1980.....	58
74.	Birds observed on the Sand Creek study area.....	58
75.	Bird species composition from three runs of the bird inventory route on the Sand Creek study area, spring 1980.....	59
76.	Mammals observed on the Sand Creek study area.....	60
77.	Results of small mammal trapping on the Sand Creek study area, summer 1980.....	60
78.	Amphibians and reptiles observed on the Sand Creek study area.....	60
79.	Average group size of mule deer in the Birney, Kirby, and Tongue River Dam areas.....	61
80.	Mule deer and coyote aerial observations per hour in the Birney study area.....	61
81.	Seasonal use of vegetation by mule deer in the Birney, Kirby and Tongue River Dam areas.....	62
82.	Seasonal activity of mule deer in the Birney, Kirby and Tongue River Dam areas.....	62
83.	Seasonal use of topography by mule deer in the Birney, Kirby and Tongue River Dam areas.....	63
84.	Seasonal use of slope by mule deer in the Birney, Kirby and Tongue River Dam areas.....	63

LIST OF TABLES

Number		Page
85.	Seasonal use of exposure by mule deer in the Birney, Kirby and Tongue River Dam areas.....	64
86.	Average group size of antelope in the Birney, Kirby, and Tongue River Dam study areas.....	64
87.	Sharp-tailed grouse dancing grounds in the Birney study area and number of males attending in 1980.....	65
88.	Bird species observed on the Birney study area.....	66
89.	Bird species composition and frequency from three census runs of the road route on the Birney study area.....	68
90.	Mammals observed on the Birney study area.....	68
91.	Results of small mammal trapping in the Birney study area.....	69
92.	Mule deer, antelope and coyote aerial observations per hour in the Kirby study area.....	69
93.	Antelope population characteristics in the Kirby study area.....	71
94.	Seasonal use of vegetation types by antelope in the Kirby and Tongue River Dam areas.....	71
95.	Seasonal activity of antelope in the Kirby and Tongue River Dam areas.....	71
96.	Seasonal use of topography by antelope in the Kirby and Tongue River Dam areas.....	72
97.	Seasonal use of slope by antelope in the Kirby and Tongue River Dam areas.....	72
98.	Seasonal use of exposure by antelope in the Kirby and Tongue River Dam areas.....	72
99.	Sharp-tailed grouse dancing grounds in the Kirby study area and number of males attending in 1980.....	73
100.	Bird species observed on the Kirby study area.....	75
101.	Bird species composition and frequency from three census runs of the road route on the Kirby study area.....	76
102.	Mammals observed on the Kirby study area.....	77

LIST OF TABLES

Number		Page
103.	Results of the small mammal trapping in the Kirby study area.....	77
104.	Mule deer and antelope aerial observations per hour in the Tongue River Dam area.....	78
105.	Antelope population characteristics in the Tongue River Dam area.....	79
106.	Bird species observed on the Tongue River Dam area....	81
107.	Bird species composition and frequency from three census runs of the road route on the Tongue River Dam area.....	82
108.	Mammals observed on the Tongue River Dam area.....	83
109.	Results of small mammal trapping in the Tongue River Dam area.....	83

Abstract

A wildlife inventory study on seven areas of southeastern Montana encompassing approximately 311,000 acres was begun in March 1980. Field work will be concluded in August 1981. This report contains data gathered through August 1980. The final report, due 31 October 1981, will be used to determine habitats unsuitable for mining according to the Secretary of the Interior's "unsuitability criteria." The principal investigators and their areas of responsibility were Peter R. Martin (Sweeney-Snyder and Greenleaf-Miller), Bill Youmans (Foster Creek and Sand Creek), and Kristi DuBois (Birney, Kirby and Tongue River Dam).

Game species observed during the first two seasons of study include mule deer, white-tailed deer, antelope, sharp-tailed grouse, sage grouse, gray partridge, ring-necked pheasant, Merriam's turkey and several waterfowl species including Canada geese and canvasback ducks. Nongame bird species of special interest or concern (Flath 1979, U.S.D.I. 1979) observed include the goshawk, sharp-shinned hawk, Cooper's hawk, ferruginous hawk, Swainson's hawk, golden eagle, bald eagle, osprey, peregrine falcon, prairie falcon, northern inland sandpiper, long-billed curlew, long-eared owl, mountain bluebird, Brewer's sparrow and field sparrow.

Data were gathered from aerial game surveys, small mammal trap lines, roadside vehicular game and non-game bird surveys, and intensive foot searches in special habitat types (i.e., prairie dog towns and cliff areas). Information recorded includes pertinent population data, vegetation type and topographic feature usage, and location for future distribution mapping.

INTRODUCTION

As the world energy situation becomes more complex and unstable, the pressure in this country to develop Montana coal reserves will increase. In order to facilitate responsible development of the coal resource with consideration for surface resources, wildlife inventory studies are being conducted on potential coal lease areas in southeastern Montana.

The wildlife inventory studies presented in this report were sponsored by the Bureau of Land Management. The study areas concerned are primarily privately owned lands overlying federal coal deposits. Information furnished by these studies will be used by the Bureau of Land Management to (1) update BLM's land use planning system; (2) establish baseline data to assist in predicting impacts of coal development; (3) assess the reclamation potential of different habitats; and (4) determine habitats unsuitable for mining according to the Secretary of the Interior's "unsuitability criteria."

Wildlife studies sponsored by coal companies in the Colstrip, Rosebud Creek, Sarpy Creek, Spring Creek and Decker areas are currently adding much information to the data base. Wildlife studies in coal field vicinities have been sponsored by the U.S. Fish and Wildlife Service and Bureau of Land Management. The Montana Department of Fish, Wildlife and Parks has also been active in gathering pertinent information. In spite of these efforts, which have been primarily directed toward game species, site-specific information is needed for each potential coal lease area. The primary game species found in the region are mule deer (*Odocoileus hemionus*), pronghorn antelope (*Antilocapra americana*), sharp-tailed grouse (*Pediacetes phasianellus*), sage grouse (*Centrocercus urophasianus*), and ring-necked pheasants (*Phasianus colchicus*). White-tailed deer (*Odocoileus virginianus*) and wild turkeys (*Meleagris gallopavo*) also inhabit the area.

Information on non-game wildlife in the region is meager. Range maps prepared by Stebbins (1966) indicate the occurrence of nineteen species of reptiles and amphibians in the area. Range maps of Hoffman and Pattie (1968) indicate the presence of 53 species of mammals. Skaar (1980) listed 255 bird species occurring in latilongs 33, 34, 43 and 44. Resident breeding status in at least one of the four latilongs concerned has been documented for 95 species. The bird inventory for the region is considered to be deficient.

These studies were begun in April 1980. Data gathered through the end of August 1980 are included in this report. Data analyses and species lists are not to be considered complete, pending completion of the final report.

PROCEDURES

Game Mammals

Observations were made during low-level fixed-wing aerial surveys in a super cub aircraft. Aerial surveys were conducted monthly and the data were compiled on a seasonal basis as follows: spring (March-May), summer (June-August), fall (September-November), and winter (December-February). Each study area was completely covered by flying a grid transect at half-mile intervals, oriented parallel to the major drainage. Flight times were planned to coincide with feeding periods so that maximum animal numbers could be observed. This biased observations in favor of the more open habitat types. Observations were also recorded during vehicular surveys and while walking through the study areas. At each observation the vegetation type, activity, type of terrain, slope, exposure and time of day were recorded (Appendix Table 1). Pertinent population data were also recorded. Each observation was assigned UTM (Universal Transverse Mercator) grid coordinates to facilitate accurate mapping of animal distribution patterns.

Game Birds

The primary emphasis was directed toward locating sharp-tailed grouse dancing grounds and sage grouse strutting grounds. The importance of these breeding grounds to these species cannot be understated. Grounds were located by driving, walking and flying low over likely terrain features and either seeing the birds on their arenas or flushing them into the air.

Pheasant crow count routes were conducted during the spring breeding season to determine the density of cock pheasants (Kimball 1949).

Ponds, sloughs, and creeks were visited during the spring and summer months to obtain waterfowl observations.

Songbirds

Species composition and relative abundance of songbirds were determined using a roadside windshield technique. A vehicle route 20 to 25 miles in length was established on each study area, with listening stops spaced at approximately one mile intervals. Bird songs heard from within a 100 m radius of the observer, during a three minute time period were recorded and mapped at each stop. Routes were selected to equally sample representative habitat types on each study area. Songbird inventory routes were conducted three times on each study area, during May and June. Nomenclature follows the A.O.U. checklist (1957) and supplements (1973,1976).

Raptors

Raptor nests were located using the methods described by Call (1978). Creek bottoms were searched in the early spring by airplane and from the ground for hawk and eagle stick nests. Suitable cliffs were examined by airplane and on foot for falcon aeries and eagle nests. Observations of all raptors except kestrels were mapped during the breeding season to aid in delineating territories. Intensive foot searches were employed when highly defensive adults were encountered. Prairie dog towns were checked during July for burrowing owl broods.

Non-game Mammals

Non-game mammals were sampled on all study areas during July and August. Two traplines were set in each of the three major habitat categories (riparian, ponderosa pine, sagebrush/grassland) and run for four consecutive days. Each trapline consisted of 25 stations, placed at 10 m intervals. Each station included one Sherman live trap and three mouse snap traps, with a rat snaptrap at every fourth station. A mixture of peanut butter and rolled oats was used as bait.

Live traps and snap traps which were sprung, but empty, were subtracted from the total trap nights.

Prairie dog towns were searched for sign of black-footed ferrets (Henderson et al. 1974, Martin 1978).

Amphibians and Reptiles

Observations of amphibians and reptiles on the study areas were noted in conjunction with other wildlife observations.

Description of Study Areas

Sweeney-Snyder

The Sweeney-Snyder study area (Figure 1) is located between Rosebud Creek and the Tongue River approximately 12 miles east of Colstrip, Montana. It lies about 20 miles south of the Yellowstone River with over 93 percent of its 74,000 plus acres located in Rosebud County. A small portion in the northeast corner of the area is located in Custer County.

There are no major water ways within the study area. Snyder Creek, Hen Creek, Cherry Creek and Eagle Creek drain the west side of the study area as they flow into Rosebud Creek. Sweeney Creek and Beaver Creek rise in the northern portion of the study area and flow north to the Yellowstone River. Nine small drainages provide for run-off from the eastern portions of the area to the Tongue River.

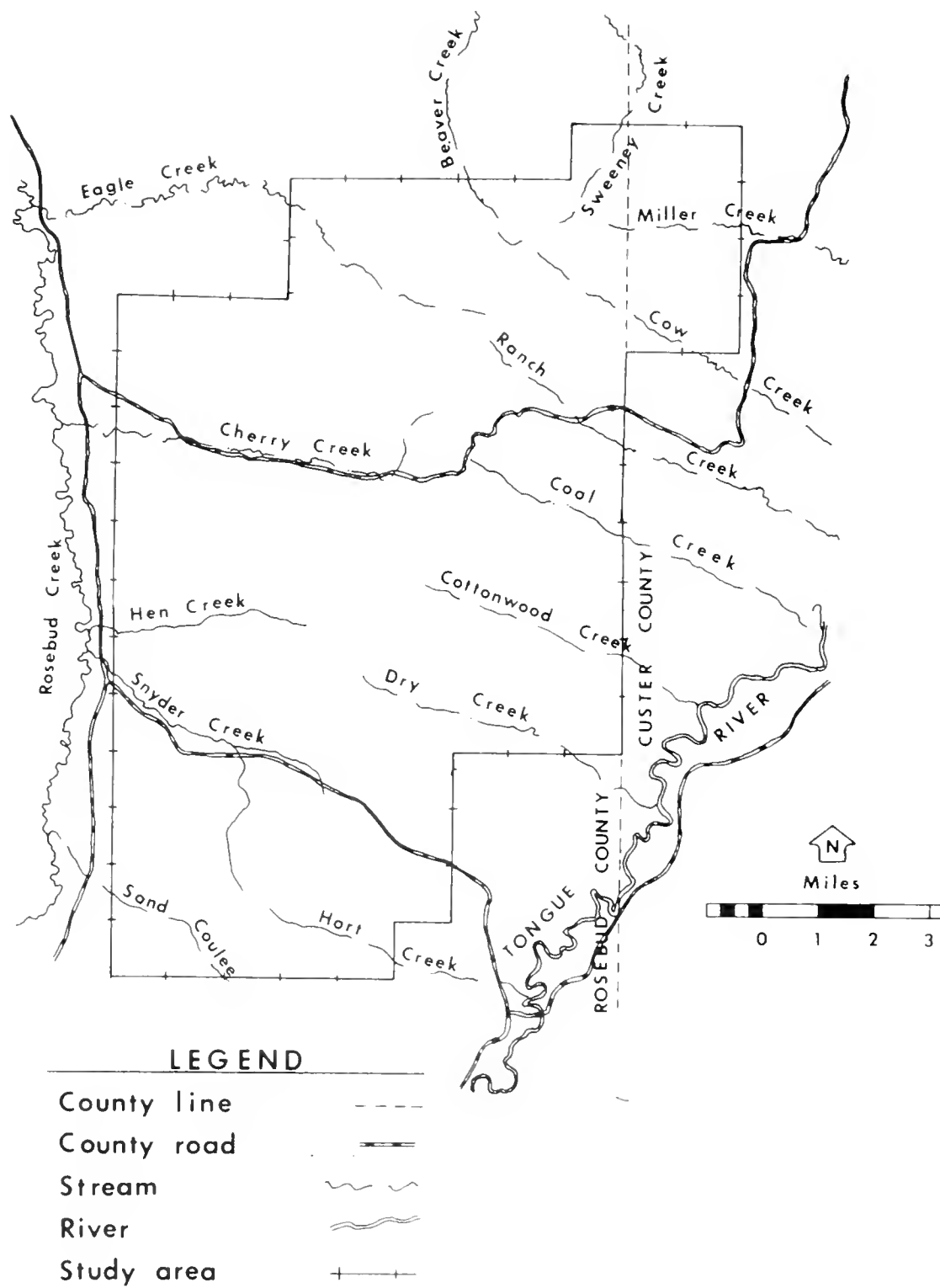


Figure 1. Sweeney-Snyder study area.

As the study area straddles the Rosebud Creek-Tongue River divide, ponderosa pine subtypes are the dominant vegetation. Sagebrush-grassland subtypes occur along the edges of the study area near the two major flood plains which lie outside the study area. Very small patches of riparian vegetation are found in the most-mesic coulee bottoms and creek bottoms. It is by far the smallest of the vegetation types found on the study area. Cattle ranching is the only agricultural business conducted within the study area.

Greenleaf-Miller

The Greenleaf-Miller study area (Figure 2) is located west of the Tongue River approximately 6 miles south of Colstrip, Montana. All of its 58,000 plus acres lie within Rosebud County. The southern boundary of the study area is the Northern Cheyenne Indian reservation.

Rosebud Creek flows through the northwest corner of the study area. Greenleaf Creek and Miller Creek are the major drainages in the study area. They rise on the reservation and flow northward into Rosebud Creek. Lay Creek, Bean Creek and Downey Coulee are also important drainages in the area.

Most of the study area is covered by sagebrush-grassland vegetation subtypes. The southwest corner and eastern edge of the study area have significant stands of ponderosa pine. Most of the riparian vegetation is located in the Rosebud Creek flood plain. Several isolated stands of deciduous trees and shrubs are found in all the smaller drainages, especially Greenleaf Creek. The agricultural fields are practically all located on lowland benches and flood plains. Alfalfa and small grains comprise the bulk of the crops. Livestock production is the principal economic endeavor within the study area. Sandstone bluffs are very common in the central and southwestern portions of the study area.

Foster Creek

The Foster Creek study area (Figure 3) is located west of Pumpkin Creek and Highway 312, about 15 miles northeast of Ashland. It is adjacent to and north of the Custer National Forest and comprises approximately 62,720 acres in Custer and Powder River counties.

All drainages on the study area are intermittent streams. Foster Creek is the principal drainage of the central and northern portions. Drainages of the southern and eastern sections join Little Pumpkin Creek and Pumpkin Creek which is the nearest perennial stream.

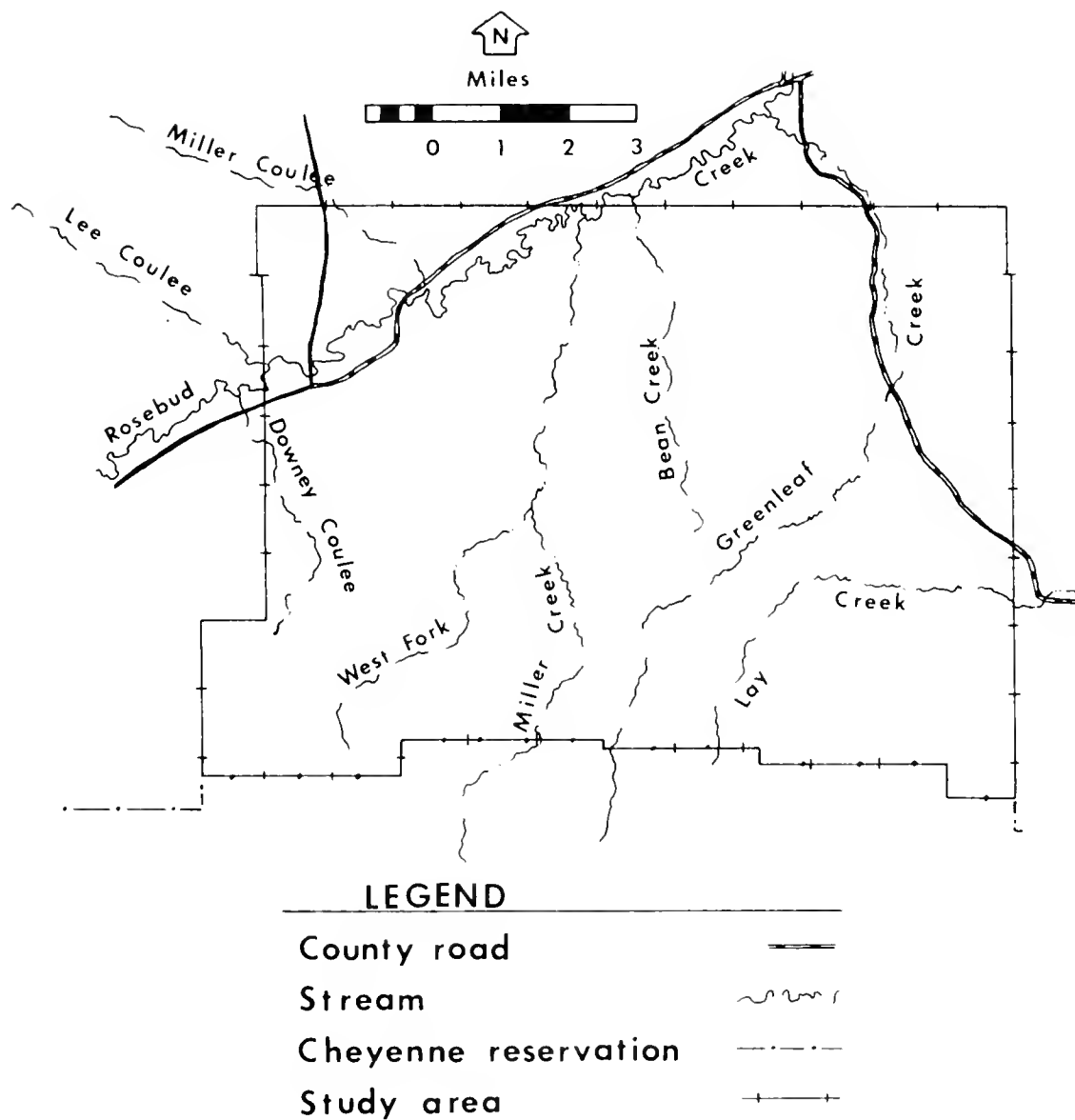


Figure 2. Greenleaf-Miller study area.

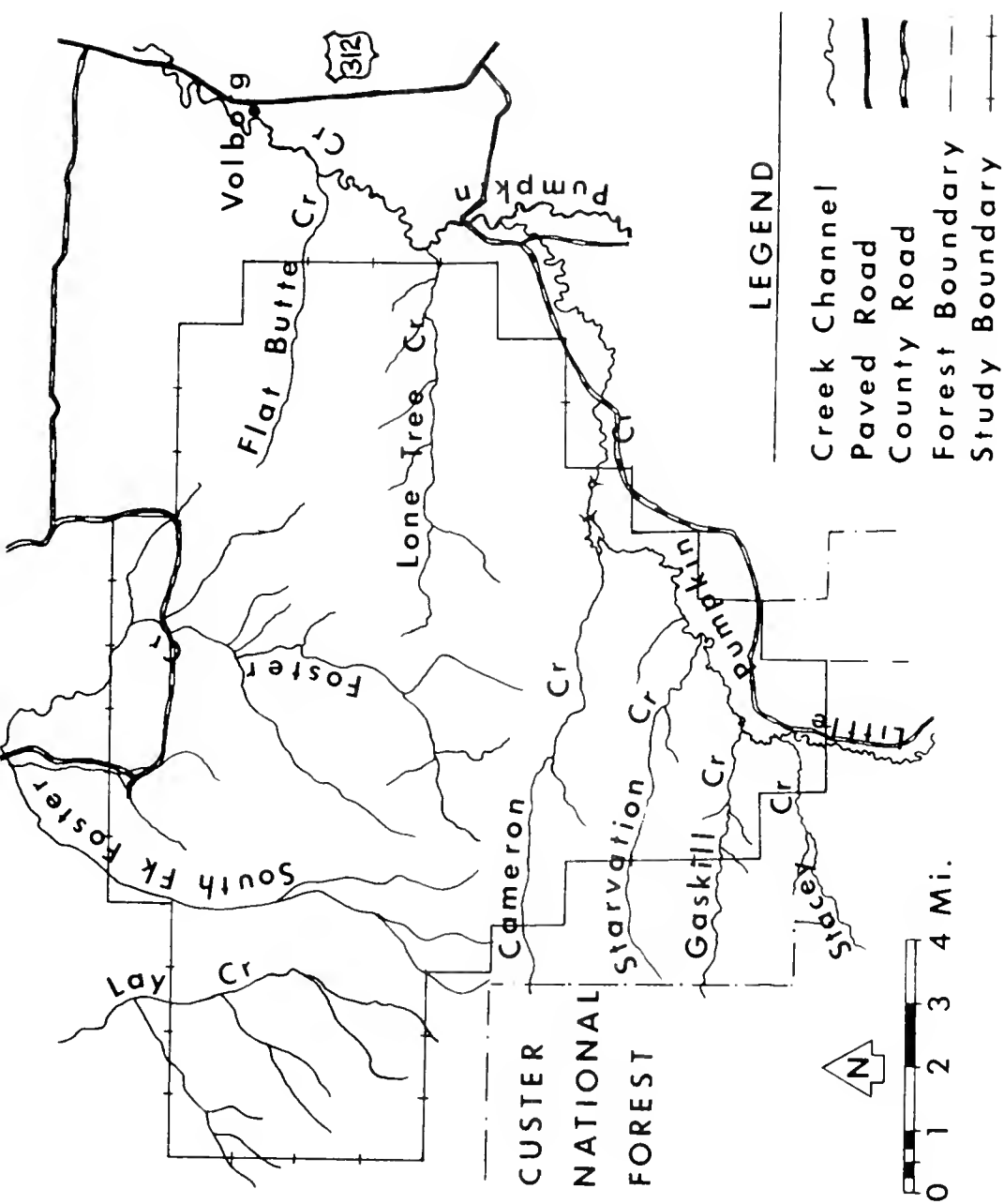


Figure 3. Foster Creek study area.

Most of the study area is characterized by rolling terrain and sagebrush and grassland habitats. Ponderosa pine breaks are prominent in the central and northeast portions. Terraces adjacent to Little Pumpkin Creek in the southeastern portion are cultivated. The remainder of the area is used predominantly for livestock grazing, with some agricultural development adjacent to larger drainages.

Sand Creek

The Sand Creek study area (Figure 4) is located east of Highway 312 and Pumpkin Creek, about 22 miles northwest of Broadus. It comprises approximately 8,960 acres in Custer and Powder River counties.

Sand Creek, an intermittent stream, flows north through the center of the study area and joins Mizpah Creek. The study area is situated on a plateau which drops off steeply along the southern and southeastern boundaries. The interior terrain, most of which is cultivated, is flat to rolling. The remainder is characterized by sagebrush and grassland habitats and is used for livestock grazing. The northwest corner section of the area is predominantly ponderosa pine breaks.

Birney

The Birney study area is about 32,640 acres in size, located west of the Tongue River and south of the Northern Cheyenne Indian Reservation near Birney, Montana (Figure 5). The topography consists of high, rugged hills rising 500 feet above the Tongue River. Vegetation is mainly ponderosa pine-juniper forest with sagebrush parks on the slopes and sagebrush on the tops of plateaus and along the larger creek bottoms. Deciduous tree and shrub riparian vegetation is well-developed along the Tongue River just outside the study area, but poorly developed along the intermittent creek bottoms in the study area. Agriculture consists of hayfields along the Tongue River.

Kirby

The Kirby study area is about 56,320 acres in size, located southwest of Birney between Rosebud Creek and the Tongue River (Figure 6). The eastern portion of the study area is very rugged, with hills rising 500 feet above the Tongue River to elevations of around 4000 feet. The western portion is composed of high, less rugged plateaus reaching elevations of 4,700 feet. Ponderosa pine-juniper forest with sagebrush or grassland parks cover the rugged eastern portion of the study area. The western portion is primarily covered by grasslands and sagebrush, with small stands of ponderosa pine trees along some of the ridges. Riparian vegetation is poorly developed in the eastern portion

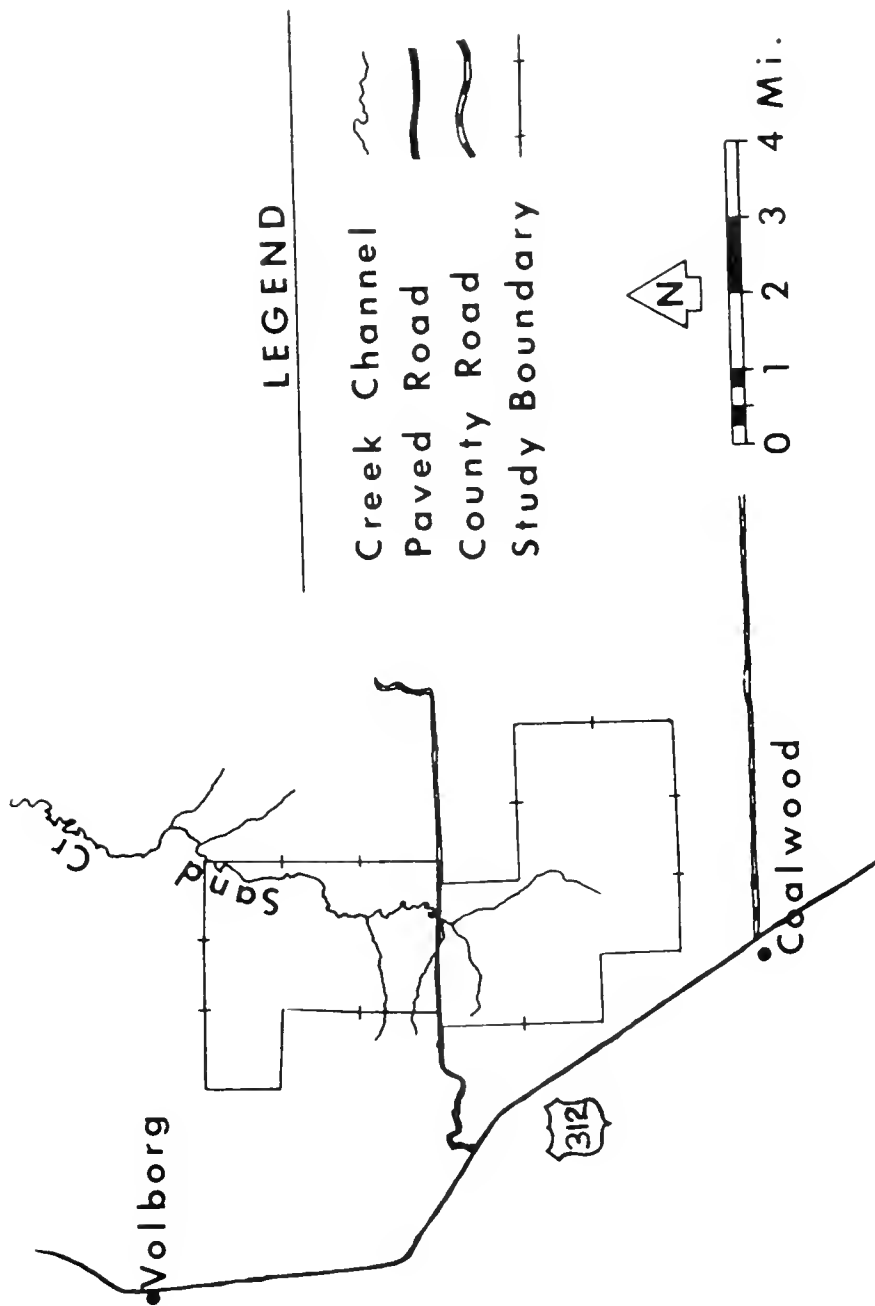


Figure 4. Sand Creek study area.

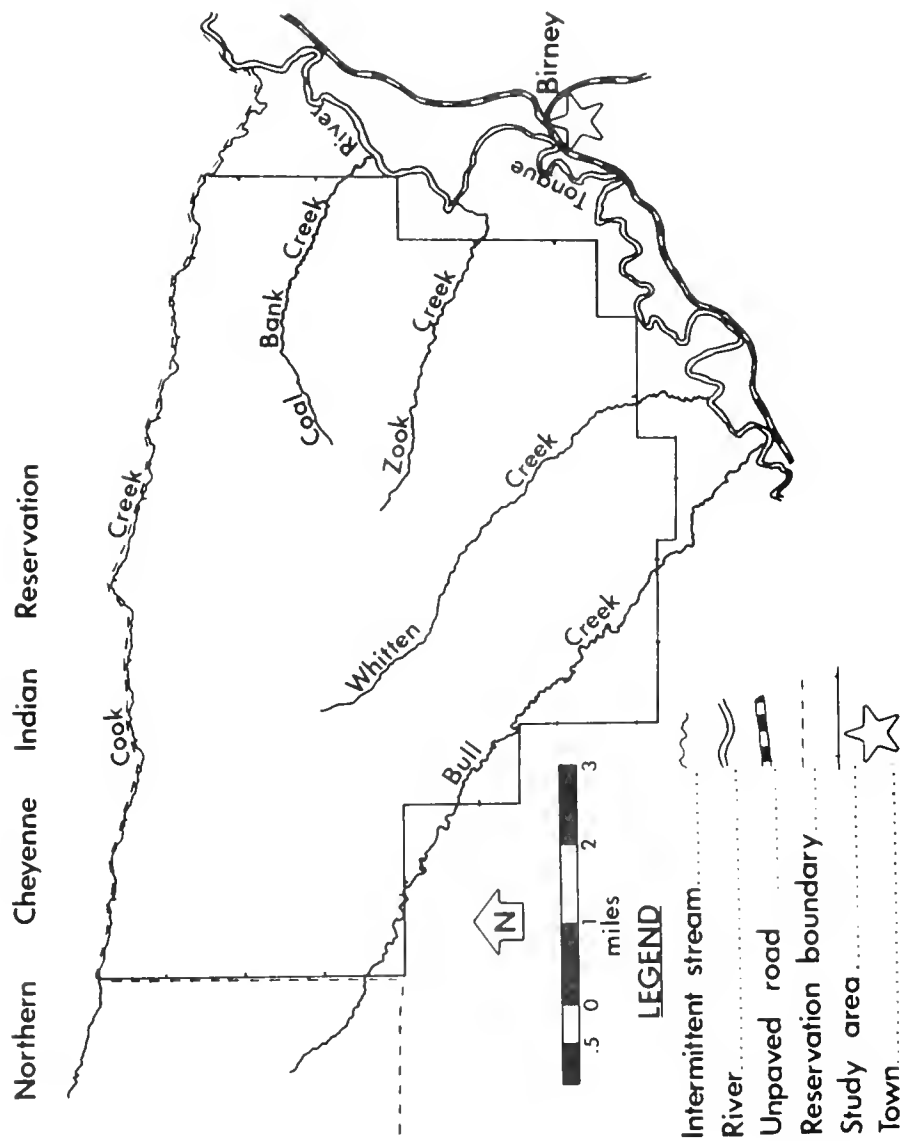


Figure 5. Birney study area.

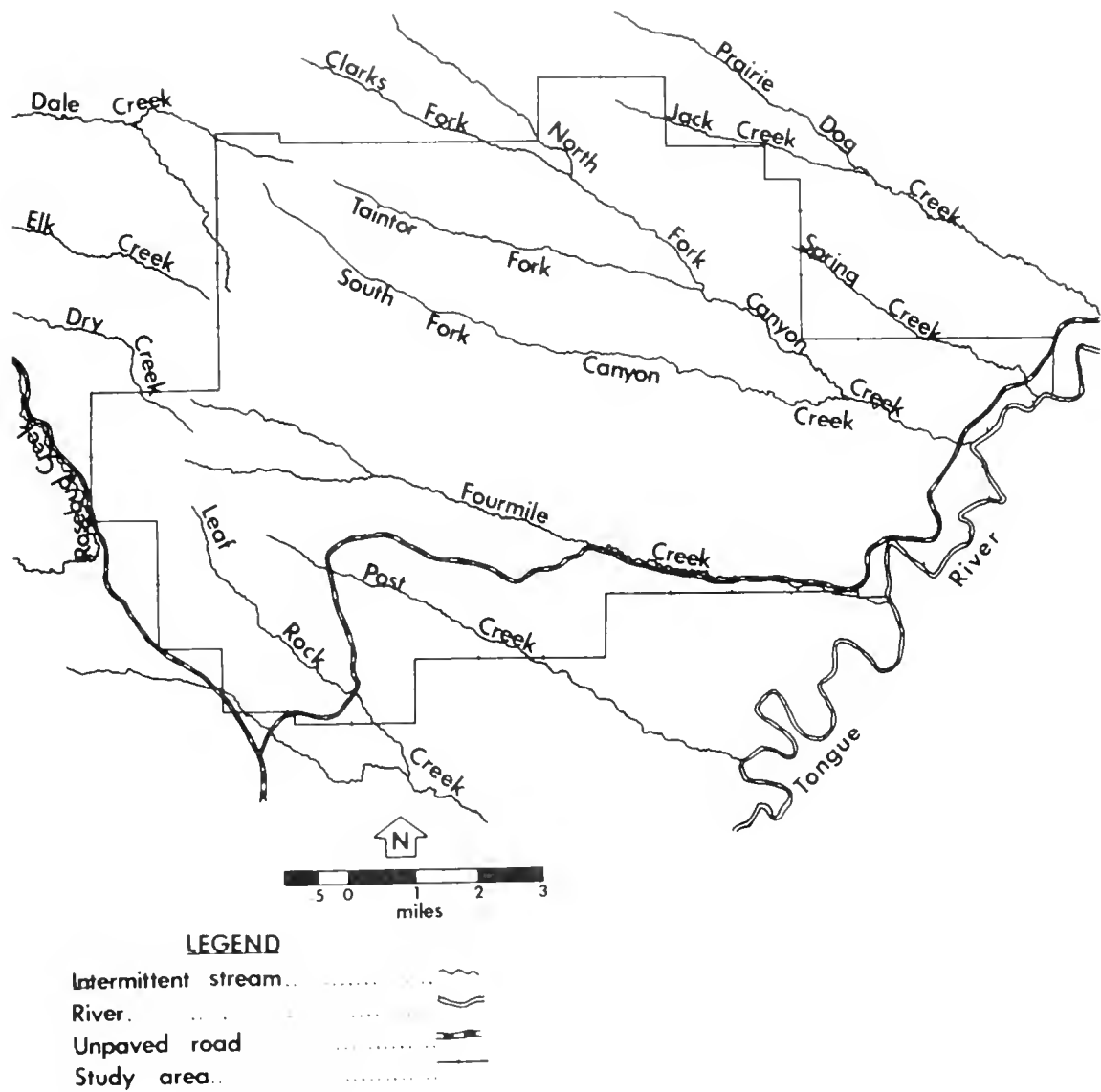


Figure 6. Kirby study area.

of the study area consisting of scattered cottonwood trees along the Tongue River and the major creek bottoms. Riparian vegetation in the western portion consists of fairly dense stands of deciduous shrubs and trees in most of the drainages. Agriculture consists of hayfields along the Tongue River and a few grain fields on the western plateaus.

Tongue River Dam

The Tongue River dam study area is located northeast of Decker, Montana around the Tongue River Reservoir (Figure 7). It covers about 18,220 acres, extending north from the reservoir along the river for about five miles. The northern part of the study area is very rugged with hills rising 600 feet above the Tongue River. The southern portion around the reservoir consists of gently rolling hills and wide, flat valleys. Ponderosa pine-juniper forests with small sagebrush parks cover the rugged northern portion. The southern part of the study area is mainly covered by sagebrush, grasslands, and skunkbush-grasslands. The river bottoms and the shoreline of the reservoir are mainly covered by grasslands. Deciduous tree and shrub riparian habitat is poorly developed, except at the southern end of the reservoir. The only agriculture consists of hayfields along the Tongue River. The East Decker and West Decker coal strip mines lie partially within the study area.

RESULTS AND DISCUSSION

All the tables and data presented at this time are incomplete and care should be taken in interpretation. Distribution maps will be presented in the final report. Each species or group of species is discussed separately for each of the three study areas.

Sweeney-Snyder

Mule Deer

Population characteristics: During the first 4 months of the study 143 mule deer have been observed in the Sweeney-Snyder study area (Table 1). Average group size was largest in May and smallest in June with 4.3 and 1.3 deer per group respectively. Mule deer observed per hour of aerial survey ranged from 39.0 in May to 5.3 per hour in June (Table 2). Other population characteristics, structure and production, will be determined during the fall surveys.

Vegetation type usage: The ponderosa pine type, by far the largest in size, had 60 and 51 percent of the observations during the first two seasons of the survey, spring and summer respectively (Table 3). Usage of the sagebrush-grassland type decreased from 40 percent in spring to 25 percent in the summer months. The creek bottom type increased from zero in the spring to 25 percent during the dry summer months.

Table 1. Average group size of mule deer in the Sweeney-Snyder and Greenleaf-Miller study areas.

Year	Month	Sweeney-Snyder			Greenleaf-Miller		
		Number	Number		Number	Number	
		Observations	Total	Average	Observations	Total	Average
1980	April	-	-	-	-	-	-
	May	21	90	4.3	4	27	6.8
	Spring	21	90	4.3	4	27	6.8
	June	9	12	1.3	11	16	1.5
	July	6	9	1.5	19	44	2.3
	August	11	32	2.9	11	33	3.0
	Summer	26	53	2.0	41	93	2.3

Table 2. Mule deer, antelope and coyote aerial observations per hour in the Sweeney-Snyder study area.

Year	Month	Hours	Aerial Observations			Observations/ Hour			Coyotes / 100:	
			Mule Deer	Ant.	Coyote	Mule Deer	Ant.	Coyote	Mule Deer	Ant.
1980	April	-	-	-	-	-	-	-	-	-
	May	2.0	78	10	3	39.0	5.0	1.5	3.8	30.0
	Spring	2.0	78	10	3	39.0	5.0	1.5	3.8	30.0
	June	1.9	12	2	2	6.3	1.1	1.1	16.7	100.0
	July	1.7	9	4	2	5.3	2.4	1.2	22.2	50.0
	Aug	2.3	32	8	2	13.9	3.5	0.9	6.3	25.0
	Summer	5.9	53	14	6	9.0	2.4	1.0	11.3	42.9

Activity: The majority of mule deer were feeding at the time of observation (Table 4). Seventy-two percent during the summer season was the highest figure recorded. Very few deer were observed lying down with the high percentage of ponderosa pine cover at least partially responsible.

Use of topography: The use of topography by mule deer is shown in Table 5. Usage of the mesa-butte categories increased from 11 percent in the spring to 24 percent of the observations in the summer months. Dissected mid-slopes had over 50 percent of the observations in both seasons.

Table 3. Seasonal use of vegetation types by mule deer in the Sweeney-Snyder study area.

Vegetation subtypes	Spring 1980 90 ¹ / ₁	Summer 1980 53	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Ponderosa pine	18 ² / ₁	-				
Sagebrush	19	19				
Grassland	4	6				
Skunkbush	11	6				
Juniper	2	21				
Snowberry	6	-				
Total Ponderosa Pine	60	51				
Sagebrush	30	6				
Deciduous shrub	7	8				
Grassland	3	11				
Total Sagebrush/ grassland	40	25				
Tree	-	4				
Shrub	-	21				
Total Creekbottom	-	25				
Ponderosa Pine	-	-				
Sagebrush/Grassland	-	-				
Creekbottom	-	-				
Total Agricultural	-	-				

¹/ Total observations

²/ Percent of observations rounded to nearest whole number

Table 4. Seasonal activity of mule deer in the Sweeney-Snyder study area.

Activity	Spring 1980 12 ¹ / ₁	Summer 1980 53	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Standing	17 ² / ₁	26				
Running	25	-				
Laying	-	2				
Feeding	58	72				

¹/ Total observations

²/ Percent of observations rounded to nearest whole number.

Use of exposure: Use of northerly slopes increased from 24 percent in spring to 45 percent of the observations in summer (Table 6). Meanwhile use of south exposures decreased from 12 to 2 percent. The area suffered under very harsh drought conditions during these months of study.

Use of slope: Usage of the two lesser slopes decreased from 83 percent in spring to 53 percent of the observations in the summer season (Table 7). This occurred in spite of a 114 percent increase in the numbers observed on flat lands. Medium and steep slope usage increased from 16 percent in spring to 47 percent in summer.

Table 5. Seasonal use of topography by mule deer in the Sweeney-Snyder study area.

Topography	Spring 1980 12 ¹ / ₂	Summer 1980 53	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Mesa-butte top	9	11				
Mesa-butte steep slopes	2	13				
Dissected mid-slopes	59	51				
Alluvium/Terrace	30	25				
Flood plain	-	-				

¹/ Total observations

²/ Percent of observations rounded to nearest whole number.

Table 6. Seasonal use of exposure by mule deer in the Sweeney-Snyder study area.

Exposure	Spring 1980 90 ¹ / ₂	Summer 1980 53	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
North	24 ² / ₂	15				
South	12	2				
East	41	8				
West	3	-				
Northeast	-	9				
Northwest	-	21				
Southeast	-	8				
Southwest	-	8				
Flat	14	30				

¹/ Total observations

²/ Percent of observations rounded to nearest whole number

Table 7. Seasonal use of slope by mule deer in the Sweeney-Snyder study area.

	Spring 1980	Summer 1980	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Slope	90 ¹ / ₂	53				
Flat	14 ² / ₂	30				
Gentle	69	23				
Medium	13	34				
Steep	3	13				

¹/ Total observations

²/ Percent of observations rounded to nearest whole number.

Antelope

Population characteristics: Only 26 antelope were observed on the Sweeney-Snyder study area during the first four months of study (Table 8). This reflects the substantial ponderosa pine acreage which is poor antelope habitat. Average group size was lowest in June, 1.5 antelope per observation, and highest in August, 4.0 per observation. Numbers were small because the antelope were spread out for fawning and to cope with the drought condition prevalent during all four study months. Numbers of antelope observed per hour of aerial survey (Table 2) were highest in May and lowest in June. Again the numbers observed were small. No fawns were observed during the June or July surveys. In August, 2 fawns were observed with 4 does, representing a low production figure of 50 fawns per 100 does (Table 9).

Vegetation type usage: During the first two seasons of study antelope were observed on very few vegetation types (Table 10). In spring the ponderosa pine grassland subtype had 73 percent of the observations. Its usage decreased to 33 percent in the summer months. The sagebrush-grassland vegetation type usage increased from 27 percent in spring to 67 percent in summer. No observations were recorded on agricultural or creekbottom types.

Activity: No activities were recorded during the spring survey (Table 11). During the summer months 60 percent of the antelope were observed running. The remainder, 40 percent, were standing at the moment of observation.

Table 8. Average group size of antelope in the Sweeney-Snyder and Greenleaf-Miller study areas.

Year	Month	Sweeney-Snyder			Greenleaf-Miller		
		Number Observations	Total	Ave.	Number Observations	Total	Ave.
1980	April	-	-	-	-	-	-
	May	3	11	3.7	2	8	4.0
	Spring	3	11	3.7	2	8	4.0
	June	2	3	1.5	11	34	3.1
	July	2	4	2.0	5	34	6.8
	Aug.	2	8	4.0	3	23	7.7
	Summer	6	15	2.5	19	91	4.8

Table 9. Antelope population characteristics in the Sweeney-Snyder area in 1980.

Month	Total	Number classified					Population Structure (%)				
		Bucks	Does	Fawns	Does	Adults	100 Bucks	100 Does	Bucks	Does	Fawns
June	3	-	3	-	-	-	-	-	100.0	-	-
July	4	2	2	-	-	-	100.0	50.0	50.0	-	-
Aug.	8	2	4	2	50.0	33.3	50.0	25.0	50.0	25.0	25.0

Use of topography: All of the antelope observed were using dissected midslopes in the Sweeney-Snyder study area (Table 12). Antelope avoided the mesa sides and plateaus as well as the creekbottom topographic features.

Use of exposures: During the spring survey all of the antelope were observed on easterly exposures (Table 13). The northeast exposure, with 73 percent of the observations, supported the most antelope. Usage of westerly slopes was 54 percent in the summer season. The southwest exposure with 47 percent received the most summer time antelope usage.

Use of slope: No antelope were observed on flat or steep slopes (Table 14). One hundred percent were seen on gentle slopes in the spring. Medium slopes were used by 67 percent of the antelope during the summer surveys.

Table 10. Seasonal use of vegetation types by antelope in the Sweeney-Snyder study area.

Vegetation Subtypes	Spring 1980	Summer 1980	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
	11 ¹ / ₂	15				
Ponderosa pine	-	-				
Sagebrush	-	-				
Grassland	73 ² / ₂	33				
Skunkbush	-	-				
Juniper	-	-				
Snowberry	-	-				
Total Ponderosa Pine	73	33				
Sagebrush	-	20				
Deciduous shrub	-	-				
Grassland	27	47				
Total sagebrush/grassland	27	67				
Tree	-	-				
Shrub	-	-				
Total creekbottom	-	-				
Ponderosa pine	-	-				
Sagebrush/grassland	-	-				
Creekbottom	-	-				
Total Agricultural	-	-				

1/ Total observations

2/ Percent of observations rounded to nearest whole number.

Table 11. Seasonal activity of antelope in the Sweeney-Snyder Study area.

Activity	Spring 1980	Summer 1980	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
	-	15 ¹ / ₂				
Standing	-	40				
Running	-	60				
Lying	-	-				
Feeding	-	-				

1/ Total observations

2/ Percent of observations rounded to the nearest whole number

Table 12. Seasonal use of topography by antelope in the Sweeney-Snyder study area.

Topography	Spring 1980 11 ¹ / ₁₅	Summer 1980 15	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Mesa-butte top	-	-				
Mesa-butte steep slopes	-	-				
Dissected mid-slopes	100	100				
Alluvium/terrace	-	-				
Flood plain	-	-				

1/ Total observations

2/ Percent of observations rounded to the nearest whole number

Table 13. Seasonal use of exposure by antelope in the Sweeney-Snyder study area.

Exposure	Spring 1980 11 ¹ / ₁₅	Summer 1980 15	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
North	-	-				
South	-	-				
East	18 ² / ₁₅	13				
West	-	7				
Northeast	73	33				
Northwest	-	-				
Southeast	9	-				
Southwest	-	47				
Flat	-	-				

1/ Total observations

2/ Percent of observations rounded to the nearest whole number

Table 14. Seasonal use of slope by antelope in the Sweeney-Snyder Study area.

Slope	Spring 1980 11 ¹ / ₁₅	Summer 1980 15	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Flat	-	-				
Gentle	100	33				
Medium	-	67				
Steep	-	-				

1/ Total observations

2/ Percent of observations rounded to the nearest whole number

Sharp-tailed Grouse

Eight sharp-tailed grouse dancing grounds were located on or near the Sweeney-Snyder study area during the spring season (Table 15). These grounds averaged 14.5 male birds per arena, ranging from 4 to 30. No broods were observed in the study area.

Sage Grouse

Two sage grouse grounds were located within the study area. Their location is given in Table 16. Each ground had 7 male birds displaying in 1980.

Ring-necked Pheasant

Ring-necked pheasants were observed on several of the small drainages within the study area. A pheasant crow count route was conducted down Rosebud Creek along the western edge of the study area. An average of 21.9 calls was recorded for the 15 stops of the route.

Merriam's Turkey

Several sightings were made in the northeast section of the study area. The turkeys, 4 toms and 5 hens, were sighted in the Cow Creek drainage during the May aerial survey. No brood sightings were made.

Waterfowl

The only waterfowl observed on the study area was the mallard duck. No broods were observed as most of the reservoirs in the study area were dry.

Songbirds and Raptors

Forty-eight bird species were identified during the first four months of the study (Table 17). The non-game species of special interest or concern (Flath 1979) observed were the golden eagle, prairie falcon, upland sandpiper, mountain bluebird, Brewer's sparrow and field sparrow.

The number, percent composition and frequency of occurrence of bird species at the twenty roadside survey stops in the Sweeney-Snyder study area are presented in Table 18. The meadowlark was the most common and abundant species, followed by the lark sparrow and chipping sparrow.

One prairie falcon aerie was located in the southwest corner of the study area. The single egg layed was later abandoned by the adult birds. Although several golden eagle and red-tailed hawk observations were made no active nests were located.

Table 15. Sharp-tailed grouse dancing grounds in the Sweeney-Snyder study area and numbers of males attending.

Ground Number	Location			Number of Males Attending	
	T	R	S	1980	1981
1	4N	45E	21 SW $\frac{1}{4}$	20	
2	4N	44E	25 NE $\frac{1}{4}$	30	
3	3N	44E	2 SE $\frac{1}{4}$	14	
4	3N	45E	19 SW $\frac{1}{4}$	8	
5	3N	44E	27 NW $\frac{1}{4}$	8	
6	2N	44E	5 SE $\frac{1}{4}$	7	
7	2N	44E	20 NW $\frac{1}{4}$	4	
8	1N	44F	7 NW $\frac{1}{4}$	25	

Table 16. Sage grouse strutting grounds in the Sweeney-Snyder Study area and numbers of males attending.

Ground Number	Location			Number of Males Attending	
	T	R	S	1980	1981
1	3N	43E	22 NW $\frac{1}{4}$	7	
2	3N	43E	34 NW $\frac{1}{4}$	7	

Table 17. Bird species observed on the Sweeney-Snyder study area.

1. Mallard	25. Pinyon jay
2. Red-tailed hawk	26. Black-capped chickadee
3. Golden eagle	27. House wren
4. Marsh hawk	28. Rock wren
5. Prairie falcon	29. American robin
6. American kestrel	30. Brown thrasher
7. Sharp-tailed grouse	31. Mountain bluebird
8. Sage grouse	32. Yellow warbler
9. Ring-necked pheasant	33. Yellow-rumped warbler
10. Turkey	34. Yellow-breasted chat
11. Killdeer	35. Western meadowlark
12. Upland sandpiper	36. Red-winged blackbird
13. Mourning dove	37. Northern oriole
14. Great-horned owl	38. Brewer's blackbird
15. Common flicker	39. Common grackle
16. Red-headed woodpecker	40. Brown-headed cowbird
17. Hairy woodpecker	41. American goldfinch
18. Eastern kingbird	42. Rufous-sided towhee
19. Western kingbird	43. Lark bunting
20. Cassin's kingbird	44. Vesper sparrow
21. Say's phoebe	45. Lark sparrow
22. Western wood pewee	46. Chipping sparrow
23. Violet-green swallow	47. Brewers sparrow
24. Black-billed magpie	48. Field sparrow

Table 18. Bird species composition and frequency of occurrence from the three Sweeney-Snyder breeding bird surveys.

Species	Total	Percent	Frequency
1. Meadowlark	102	23.3	100
2. Lark sparrow	62	14.2	80
3. Chipping sparrow	32	7.3	60
4. Mourning dove	18	4.1	60
5. American robin	19	4.3	55
6. Brown-headed cowbird	16	3.7	55
7. Brewer's blackbird	29	6.6	50
8. House wren	20	4.6	45
9. Rufous-sided towhee	14	3.2	35
10. Brewer's sparrow	10	2.3	35
11. Vesper sparrow	11	2.5	30
12. Ring-necked pheasant	8	1.8	30
13. Yellow warbler	19	4.3	25
14. Eastern kingbird	14	3.2	25
15. Mountain bluebird	6	1.4	20
16. Northern oriole	4	0.9	20
17. Pinyon jay	4	0.9	20
18. Say's phoebe	7	1.6	15
19. Violet-green swallow	6	1.4	15
20. Common flicker	3	0.7	15
21. Killdeer	5	1.1	10
22. Cassin's kingbird	4	0.9	10
23. Brown thrasher	4	0.9	10
24. Black-billed magpie	2	0.5	10
25. Yellow-rumped warbler	2	0.5	10
26. Black-capped chickadee	2	0.5	10
27. Red-winged blackbird	2	0.5	10
28. Western kingbird	2	0.5	5
29. Rock wren	2	0.5	5
30. Upland sandpiper	1	0.5	5
31. Sharp-tail grouse	1	0.5	5
32. Western wood pewee	1	0.5	5
33. Yellow-breasted chat	1	0.5	5
34. American kestrel	1	0.5	5
35. American goldfinch	1	0.5	5
36. Common grackle	1	0.5	5
37. Red-tailed hawk	1	0.5	5
38. Field sparrow	1	0.5	5

Non-game Mammals

Mammals observed on the study area are given in Table 19. None of these species are listed by Flath (1979) as being of special interest or concern.

The results of the summer small mammal trapping effort are given in Table 20. Only two species were captured on the three habitat types, deer mouse (*Peromyscus maniculatus*) and house mouse (*Mus musculus*). The riparian habitat with 1.6 captures per 100 trap nights had the highest density of small mammals. The ponderosa pine type trap line produced the fewest captures, 3, the lowest density, 0.36 captures per 100 trap nights. Summer trapping of small mammals is not very productive in terms of return per unit of effort.

Amphibians and Reptiles

Three species were observed in the Sweeney-Snyder study area (Table 21). None were listed by Flath (1979) as being of special interest or concern.

Table 19. Mammals observed on the Sweeney-Snyder study area.

1. Coyote	<i>Canis latrans</i>
2. Red fox	<i>Vulpes vulpes</i>
3. Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
4. Deer mouse	<i>Peromyscus maniculatus</i>
5. House mouse	<i>Mus musculus</i>
6. Porcupine	<i>Erethizon dorsatum</i>
7. Desert cottontail	<i>Sylvilagus audubonii</i>
8. Mule deer	<i>Odocoileus hemionus</i>
9. Antelope	<i>Antilocapra americana</i>

Table 20. Results of small mammal trapping on the Sweeney-Snyder study area during the summer season.

	Riparian	Ponderosa Pine	Sagebrush-Grassland
Total captures	13	3	4
Trap nights	811	839	836
Captures/100 trap nights	1.60	0.39	0.48
Number of species caught	2	1	1
Species:			
<i>Peromyscus maniculatus</i>	6	3	4
<i>Mus musculus</i>	7	-	-

Table 21. Amphibians and reptiles observed on the Sweeney-Snyder study area.

1. Sagebrush lizard	<i>Sceloporus graciosus</i>
2. Prairie rattlesnake	<i>Crotalus viridis</i>
3. Great plains toad	<i>Bufo cognatus</i>

Greenleaf-Miller

Mule Deer

Population characteristics: One hundred and twenty mule deer were observed during the first four months of study (Table 1). Average group size was highest in May, 6.8 mule deer per group, and lowest in June, 1.5 mule deer per group. Numbers of mule deer observed per hour of aerial survey (Table 22) were lowest in June when 8.9 per hour were observed and highest in July, 21.0 observed per hour. Both spring and summer averages were fairly low. The spring average was lower than that observed on the Sweeney-Snyder study area while the summer average was higher.

Vegetation type usage: Seventy percent of the spring mule deer observations were in the creekbottom vegetation type (Table 23). The remaining 30 percent were observed in the ponderosa pine type. Mule deer dispersed to all four major vegetation types in fairly even percentages during the summer months. The importance of the creekbottom type is easily seen as it is by far the smallest of the vegetation types in terms of land mass.

Activity: Most deer were observed standing, 55 percent, during the summer surveys (Table 24). Thirty-two percent were feeding at the time of observation.

Use of topography: Mule deer were concentrated on the mid slope areas during the spring season (Table 25). No observations were made on plateaus or mesa tops nor on the flood plains. These two features had 16 and 13 percent of the observations, respectively, during the summer months. The steep mesa-butte slopes, on which vegetation dries up first, received the least amount of use by Greenleaf-Miller mule deer.

Use of exposure: Northerly and easterly exposures received most of the mule deer usage during the spring season survey (Table 26) with 81 and 89 percent respectively. No observations were made on southerly exposures. Flat land usage increased from zero during spring to 57 percent of the observations in the summer months. The various exposures were nearly equally utilized by mule deer during the summer time.

Table 22. Mule deer, antelope and coyote aerial observations per hour in the Greenleaf-Miller study area.

		Aerial Observations				Observations/Hour			Coyotes/100:	
Year	Month	Hours	Mule Deer	Ant.	Coyote	Mule Deer	Ant.	Coyote	Mule Deer	Ant.
1980	April	-	-	-	-	-	-	-	-	-
	May	1.6	27	8	3	16.9	5.0	1.9	11.1	37.5
	Spring	1.6	27	8	3	16.9	5.0	1.9	11.1	37.5
	June	1.8	16	27	5	8.9	15.0	2.8	31.3	18.5
	July	2.1	44	34	3	21.0	16.2	1.4	6.8	8.8
	Aug.	1.8	33	23	7	18.3	12.8	3.9	21.2	30.4
	Summer	5.7	93	84	15	16.3	14.7	2.6	16.1	17.9

Table 23. Seasonal use of vegetation types by mule deer in the Greenleaf-Miller study area.

Vegetation Subtypes	Spring 1980	Summer 1980	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
	27 ¹ / ₂	93				
Ponderosa pine	11 ² / ₂	11				
Sagebrush	19	3				
Grassland	-	9				
Skunkbush	-	10				
Juniper	-	-				
Snowberry	-	-				
Total Ponderosa Pine	30	32				
Sagebrush	-	24				
Deciduous shrub	-	-				
Grassland	-	1				
Total Sagebrush/Grassland	-	25				
Tree	70	16				
Shrub	-	4				
Total Creekbottom	70	20				
Ponderosa pine	-	-				
Sagebrush/grassland	-	-				
Creekbottom	-	23				
Total Agricultural	-	23				

¹/ Total observations

²/ Percent of observations rounded to nearest whole number

Table 24. Seasonal activity of mule deer in the Greenleaf-Miller study area.

Activity	Spring 1980	Summer 1980 93 ¹ /	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Standing	-	55				
Running	-	9				
Lying	-	4				
Feeding	-	32				

1/ Total observations

2/ Percent of observations rounded to nearest whole number

Table 25. Seasonal use of topography by mule deer in the Greenleaf-Miller study area.

Topography	Spring 1980 27 ¹ /	Summer 1980 93	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Mesa-butte top	-	16				
Mesa-Butte steep slopes	11	3				
Dissected mid-slopes	19	32				
Alluvium/terrace	70	35				
Flood plain	-	13				

1/ Total observations

2/ Percent of observations rounded to nearest whole number

Table 26. Seasonal use of exposure by mule deer in the Greenleaf-Miller study area.

Exposure	Spring 1980 27 ¹ /	Summer 1980 93	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
North	-	8				
South	-	6				
East	19	5				
West	-	-				
Northeast	70	10				
Northwest	11	2				
Southeast	-	5				
Southwest	-	6				
Flat	-	57				

1/ Total observations

2/ Percent of observations rounded to nearest whole number

Use of slope: Eighty-nine percent of the spring mule deer observations were on gentle slopes (Table 27). The remainder were on steep slopes. During the dry summer months, usage shifted to flat lands, gentle and medium slopes with 57, 19 and 18 percent of the mule deer observations respectively. Steep slope usage declined to 5 percent during the summer season.

Table 27. Seasonal use of slope by mule deer in the Greenleaf-Miller study area.

Slope	Spring 1980 27 ¹ / ₁	Summer 1980 93	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Flat	-	57				
Gentle	89	19				
Medium	-	18				
Steep	11	5				

¹/ Total observations

²/ Percent of observations rounded to nearest whole number.

Antelope

Population characteristics: Ninety-nine antelope observations were recorded during the first two seasons of study on the Greenleaf-Miller area (Table 8). Average group size was highest in August, 7.7 antelope per group, and lowest in June, 3.1 antelope per group. Late June and early July is the height of the fawning season in this area. During these two months, the highest numbers of antelope were observed per hour of aerial survey (Table 22). July was highest with 16.2 antelope observed per hour. May was the least productive month when only 5.0 antelope were observed per hour.

Production data and population structures for Greenleaf-Miller antelope are presented in Table 28. Fawn production figures were highest in August, 66.7 fawns per 100 does, but the percentage of fawns in the population was highest in July, 29.4 percent. There appears to be some movement of antelope between the study area and nearby areas.

Vegetation type usage: The sagebrush/grassland type is most important to antelope. During the spring and summer seasons, 75 and 90 percent, respectively, of the antelope were observed within sagebrush/grassland vegetation subtypes. The remainder of the antelope in both seasons were observed on the ponderosa pine-grassland vegetation subtype (Table 29).

Table 28. Antelope population characteristics in the Greenleaf-Miller study area.

Month	Total	Number Classified			Fawns:100		Bucks:		Population Structure (5)		
		Bucks	Does	Fawns	Does	Adults	100	Does	Bucks	Does	Fawns
June	33	3	24	6	25.0	22.2	12.5	9.1	72.7	18.2	
July	34	3	21	10	47.6	41.7	14.3	8.8	61.8	29.4	
Aug.	23	8	9	6	66.7	35.3	88.9	34.8	39.1	26.1	

Table 29. Seasonal use of vegetation types by antelope in the Greenleaf-Miller study area.

Subtypes	Spring	Summer	Fall	Winter	Spring	Summer
	1980	1980	1980	'80-81	1981	1981
	81/	91				
Ponderosa pine	-	-				
Sagebrush	-	-				
Grassland	25	10				
Skunkbush	-	-				
Juniper	-	-				
Snowberry	-	-				
Total Ponderosa pine	25	10				
Sagebrush	-	41				
Deciduous shrub	-	1				
Grassland	75	48				
Total Sagebrush/Grassland	75	90				
Tree	-	-				
Shrub	-	-				
Total Creekbottom	-	-				
Ponderosa pine	-	-				
Sagebrush/grassland	-	-				
Creekbottom	-	-				
Total Agricultural	-	-				

1/ Total observations

2/ Percent of observations rounded to nearest whole number.

Activity: Most antelope were standing at the moment of observation (Table 30) in the summer of 1980, 47 percent. They were followed by those in the feeding and lying categories with 18 and 9 percent respectively.

Use of topography: Antelope used the dissected midslopes almost exclusively (Table 31). Only 6 head were observed in any other category, that being the alluvium/terrace category during the spring season.

Use of exposure: Southerly exposures received the most usage during both seasons of the study to date (Table 32). Spring season, with 75 percent of the antelope on a southerly exposure, was followed in summer with a 55 percent figure. North slope usage increased from zero to 37 percent from spring to summer respectively. Easterly slopes decreased from 100 percent in spring to 38 percent in summer. Westerly slope usage was 36 percent during the summer months. Antelope were much more evenly distributed during summer than during spring in the Greenleaf-Miller study area.

Table 30. Seasonal activity of antelope in the Greenleaf-Miller study area.

	Spring 1980	Summer 1980	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Activity	-	91 ¹ / ₂				
Standing	-	47				
Running	-	9				
Lying	-	18				
Feeding	-	26				

¹/ Total observations

²/ Percent of observations rounded to the nearest whole number

Table 31. Seasonal use of topography by antelope in the Greenleaf-Miller study area.

	Spring 1980	Summer 1980	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Topography	81 ¹ / ₂	91				
Mesa-Butte top	-	-				
Mesa-Butte steep slopes	-	-				
Dissected mid-slopes	25 ² / ₂	100				
Alluvium/Terrace	75	-				
Flood plain	-	-				

¹/ Total observations

²/ Percent of observations rounded to the nearest whole number.

Table 32. Seasonal use of exposure by antelope in the Greenleaf-Miller study area.

Exposure	Spring 1980 81/	Summer 1980 91	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
North	-	12				
South	-	13				
East	252/	5				
West	-	2				
Northeast	-	21				
Northwest	-	4				
Southeast	75	12				
Southwest	-	30				
Flat	-					

1/ Total observations

2/ Percent of observations rounded to the nearest whole number.

Use of slope: No antelope were observed on flat lands nor on steep slopes. During the summer months usage of gentle slopes was slightly higher than of medium slopes, 59 percent and 41 percent respectively (Table 33).

Table 33. Seasonal use of slope by antelope in the Greenleaf-Miller study area.

Slope	Spring 1980 81/	Summer 1980 91	Fall 1980	Winter '80-81	Spring 1981	Summer 1981
Flat	-	-				
Gentle	100	59				
Medium	-	41				
Steep	-	-				

1/ Total observations

2/ Percent of observations rounded to the nearest whole number.

Sharp-tailed Grouse

Twelve sharp-tailed grouse dancing grounds were located in the Greenleaf-Miller study area (Table 34). A total of 213 male birds was observed displaying on these grounds. The average number of males per ground was 17.75. No broods were observed.

Table 34. Sharp-tailed grouse dancing grounds in the Greenleaf-Miller study area and number of males attending.

Ground Number	Location			Number of Males Attending	
	T	R	S	1980	1981
1	1S	42E	6 SE $\frac{1}{4}$	8	
2	1N	42E	31 SE $\frac{1}{4}$	15	
3	1S	42E	16 SW $\frac{1}{4}$	20	
4	1S	42E	14 NW $\frac{1}{4}$	36	
5	1S	42E	11 SW $\frac{1}{4}$	11	
6	1S	42E	1 SW $\frac{1}{4}$	7	
7	1S	42E	24 SW $\frac{1}{4}$	21	
8	1S	43E	6 NE $\frac{1}{4}$	12	
9	1S	43E	10 NE $\frac{1}{4}$	16	
10	1S	43E	9 SE $\frac{1}{4}$	26	
11	1S	43E	21 SE $\frac{1}{4}$	26	
12	1S	43E	36 NE $\frac{1}{4}$	15	

Ring-necked Pheasant

Two pheasant crow count surveys were conducted in the Greenleaf-Miller study area. Pheasant density was highest along Rosebud Creek where an average of 30.4 crows per stop was recorded on a 10 mile route. A 5 mile route along Greenleaf Creek resulted in an average of 2.8 calls per stop.

Other Game Species

White-tailed deer and gray partridges were observed on the study area. Their numbers were too low to permit reliable analysis. While no sage grouse or turkeys were actually observed on the immediate study area, they have been reported in the nearby vicinity and may use the area on occasions.

Mallard ducks were the only waterfowl species observed on the study area (Table 35).

Songbirds and Raptors

Fifty-two bird species were observed on the Greenleaf-Miller study area during the first four months of the study (Table 35). Non-game species of special interest or concern (Flath 1979, U.S.D.I 1979) were the sharp-shinned hawk, Cooper's hawk, golden eagle, prairie falcon, mountain bluebird and Brewer's sparrow.

Table 35 Bird species observed on the Greenleaf-Miller study area.

1. Mallard	46. Red crossbill
2. Sharp-shinned hawk	47. Rufous-sided towhee
3. Cooper's hawk	48. Lark bunting
4. Red-tailed hawk	49. Vesper sparrow
5. Golden eagle	50. Lark sparrow
6. Prairie falcon	51. Chipping sparrow
7. American kestrel	52. Brewer's sparrow
8. Sharp-tailed grouse	
9. Ring-necked pheasant	
10. Gray partridge	
11. Killdeer	
12. Upland sandpiper	
13. Mourning dove	
14. White-throated swift	
15. Common flicker	
16. Red-headed woodpecker	
17. Yellow-bellied sapsucker	
18. Eastern kingbird	
19. Western kingbird	
20. Cassin's kingbird	
21. Say's phoebe	
22. Least flycatcher	
23. Western wood pewee	
24. Violet-green swallow	
25. Rough-winged swallow	
26. Barn swallow	
27. Cliff swallow	
28. Black-billed magpie	
29. Common crow	
30. Pinyon jay	
31. Black-capped chickadee	
32. House wren	
33. Rock wren	
34. Brown thrasher	
35. American robin	
36. Mountain bluebird	
37. Loggerhead shrike	
38. Yellow warbler	
39. Western meadowlark	
40. Red-winged blackbird	
41. Northern oriole	
42. Brewer's blackbird	
43. Brown-headed cowbird	
44. Black-headed grossbeak	
45. American goldfinch	

The number, percent composition and frequency of occurrence of bird species observed during the roadside survey in the Greenleaf-Miller study area are presented in Table 36. The western meadowlark was the most common of the 46 species recorded. The lark sparrow and mourning dove followed the meadowlark in frequency of occurrence. Large flocks of cliff swallows and lark buntings, observed at one stop each, resulted in those two species' high percent of composition ranking.

One golden eagle nest was located. The stick nest was situated near the top of a cliff overlooking a prairie dog town. One young eagle was fledged from the nest in 1980. Two red-tailed hawk nests were located in the study area. Both were stick nests situated on cliff faces. One nest had two fledglings. No young were visible in the other. Prairie falcons were observed hunting in the study area but no nests were found.

Non-game Mammals

Fourteen mammal species were observed on the study area during the first four months of this study (Table 37). The black-tailed prairie dog (*Cynomys ludovicianus*) is listed by Flath (1979) as a species of special interest or concern.

Two small prairie dog towns were located on the study area. No sign of black-footed ferrets was detected at either site. The towns are located as follows: T1N, R42E, S36, SW $\frac{1}{4}$ and T1S, R42E, S21, SW $\frac{1}{4}$.

Small mammal trapping results are shown in Table 38. The house mouse and deer mouse were the primary species. The riparian habitat type with 1.99 captures per 100 trap nights had the highest density of small mammals. The sagebrush-grassland type with only 2 captures in 816 trap nights supported the least numbers of small mammals.

Amphibians and Reptiles

Two species were observed in the Greenleaf-Miller study area (Table 39). Neither is listed as a species of special interest or concern (Flath 1979).

Table 36. Bird species composition and frequency of occurrence from three Greenleaf-Miller breeding bird surveys.

Species	Total	Percent	Frequency
1. Western meadowlark	140	17.9	100
2. Lark sparrow	39	5.0	75
3. Mourning dove	16	2.0	55
4. House wren	21	2.7	45
5. Western wood peewee	18	2.3	45
6. Eastern kingbird	17	2.2	45
7. Yellow warbler	27	3.4	40
8. Rufous-sided towhee	18	2.3	40
9. Vesper sparrow	16	2.0	40
10. American robin	17	2.2	35
11. Chipping sparrow	13	1.7	35
12. Brown-headed cowbird	12	1.5	35
13. Brewer's sparrow	10	1.3	30
14. Ring-necked pheasant	20	2.6	25
15. Brewer's blackbird	13	1.7	25
16. Rock wren	10	1.3	25
17. Mountain bluebird	6	0.8	25
18. Western kingbird	9	1.2	20
19. Northern oriole	7	0.9	20
20. Pinyon jay	5	0.6	20
21. Red-headed woodpecker	4	0.5	20
22. Sharp-tailed grouse	8	1.0	15
23. Common flicker	5	0.6	15
24. Say's phoebe	3	0.4	15
25. Red-winged blackbird	14	1.8	10
26. Cassin's kingbird	7	0.9	10
27. Killdeer	6	0.8	10
28. Least flycatcher	4	0.5	10
29. Yellowthroat	2	0.3	10
30. Violet-green swallow	2	0.3	10
31. American goldfinch	2	0.3	10
32. American kestrel	2	0.3	10
33. Red crossbill	2	0.3	10
34. Yellow-breasted chat	2	0.3	10
35. Cliff swallow	170	21.7	5
36. Lark bunting	100	12.8	5
37. Barn swallow	4	0.5	5
38. Rough-winged swallow	3	0.4	5
39. Brown thrasher	2	0.3	5
40. Upland sandpiper	1	0.1	5
41. Black-capped chickadee	1	0.1	5
42. Common crow	1	0.1	5
43. White-throated swift	1	0.1	5
44. Cooper's hawk	1	0.1	5
45. Yellow-bellied sapsucker	1	0.1	5
46. Black-headed grosbeak	1	0.1	5

Table 37. Mammals observed on the Greenleaf-Miller study area.

1. Masked shrew	<i>Sorex cinereus</i>
2. Striped skunk	<i>Mephitis mephitis</i>
3. Coyote	<i>Canis latrans</i>
4. Black-tailed prairie dog	<i>Cynomys ludovicianus</i>
5. Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
6. Deer mouse	<i>Peromyscus maniculatus</i>
7. Bushytail woodrat	<i>Neotoma cinerea</i>
8. Prairie vole	<i>Microtus ochrogaster</i>
9. House mouse	<i>Mus musculus</i>
10. Porcupine	<i>Erethizon dorsatum</i>
11. Desert cottontail	<i>Sylvilagus audubonii</i>
12. Mule deer	<i>Odocoileus hemionus</i>
13. Whitetail deer	<i>Odocoileus virginianus</i>
14. Antelope	<i>Antilocapra americana</i>

Table 38. Results of small mammal trapping on the Greenleaf-Miller study area during the summer season.

	Riparian	Ponderosa Pine	Sagebrush- Grassland
Total captures	16	10	2
Trap nights	803	829	816
Captures/100 trap nights	1.99	1.21	0.24
Number of species caught	4	3	2
Species:			
<i>Peromyscus maniculatus</i>	3	6	1
<i>Mus musculus</i>	11	2	1
<i>Sorex cinereus</i>	1	-	-
<i>Microtus ochrogaster</i>	1	-	-
<i>Neotoma cinerea</i>	-	2	-

Table 39. Amphibians and reptiles observed on the Greenleaf-Miller study area.

1. Great plains toad	<i>Bufo cognatus</i>
2. Prairie rattlesnake	<i>Crotalus viridis</i>

Foster Creek

Mule Deer

Population characteristics: Nearly 800 mule deer were observed on the Foster Creek study area during the first four and one half months of the study (Table 40). Deer were most readily observed during spring when group size was at its peak. Observations per hour of aerial survey peaked in May (Table 41).

Table 40. Mean group size for mule deer on the Foster Creek and Sand Creek study areas.

Year	Month	Foster Creek			Sand Creek		
		No. Observ.	Total Individ.	\bar{x}	No. Observ.	Total Individ.	\bar{x}
1980	April	31	250	8.1	4	37	9.2
	May	39	181	4.6	11	68	6.2
	Spring	70	431	6.2	15	105	7.0
	June	33	55	1.7	20	39	2.0
	July	98	187	1.9	27	55	2.0
	Aug.	40	113	2.8	15	49	3.3
	Summer	171	355	2.1	62	143	2.3

Table 41. Mule deer, antelope and coyote aerial observations per hour on the Foster Creek study area.

Year	Month	Aerial Observ.			Observ./Hour			Coyotes/100:	
		Hours	Mule		Mule		Coyote	Mule	
			Deer	Ant.	Deer	Ant.		Deer	Ant.
1980	April	6	245	-1/	3	40.8	-	1.2	-
	May	2	154	84	1	77	42	0.6	1.2
	Spring	8	399	84	4	49.9	10.5	1.0	4.8
	June	4	31	110	1	7.8	27.5	.2	3.9
	July	4.25	103	121	1	24.2	28.5	.2	0.8
	Aug.	2.25	89	115	1	39.6	51.1	.4	0.9
	Summer	10.5	223	346	3	21.2	33.9	.3	0.3

1/ No observations were recorded

Vegetation type usage: Seasonal use of vegetation types by mule deer is presented in Table 42. Use of ponderosa pine habitats was undoubtedly underestimated due to the difficulty of observing deer in coniferous cover. In spite of this observational bias, 29 percent of spring observations and 17 percent of summer observations occurred in ponderosa pine types. Usage of sagebrush/grassland types increased from 13 percent during spring to 22 percent in summer, while use of agricultural types dropped between seasons. Deer made heavy use of creekbottom types during both spring (39%) and summer (49%). Mesic creekbottom habitats were especially important to deer during prevailing drought conditions of 1980.

Activity: Mule deer activity at the time of observation is presented in Table 43. Feeding activity was more prevalent during spring than in summer.

Table 42. Seasonal use of vegetation types by mule deer on the Foster Creek study area.

Vegetation Subtypes	Spring 1980 431 ^{1/}	Summer 1980 355
Ponderosa pine	19 ^{2/}	12
Sagebrush	10	4
Grassland	-	1
Skunkbush	-	-
Juniper	-	-
Snowberry/Rose	-	-
Total Ponderosa pine	29	17
Sagebrush	13	18
Deciduous shrub	-	1
Grassland	-	3
Total Sagebrush/Grassland	13	22
Deciduous tree	11	20
Shrub	28	29
Total Creekbottom	39	49
Ponderosa pine	-	-
Sagebrush/grassland	10	9
Creekbottom	9	3
Total Agricultural	19	12

^{1/} Total individual observations

^{2/} Percent of total observations

Table 43. Seasonal activity of mule deer on the Foster Creek study area.

Activity	Spring	Summer
	1980	1980
	431 <u>1</u> /	355
Standing	50 <u>2</u> /	51
Running	tr <u>3</u> /	8
Bedded	9	5
Feeding	41	32
Walking	tr	3

1/ Total individual observations

2/ Percent of total observations

3/ tr = trace; a percentage less than 0.5.

Use of topography: Mule deer observations indicate the dissected mid-slope and flood plain categories to be most heavily used (Table 44). Use of dissected mid-slopes declined from 55 percent during spring to 29 percent in summer while use of flood plains increased from 29 percent to 55 percent in the same period. This shift from slopes to lowlands was probably due to greater availability of water, succulent forage and relief from high temperatures in more mesic lowland habitats.

Use of exposure: The percentage of mule deer observations on flat terrain nearly doubled, from 35 percent in spring to 68 percent during summer (Table 45). This shift reflects heavier use of mesic lowland areas during summer.

Use of slope: The percentage of mule deer observations on flat terrain doubled from 34 percent in spring to 68 percent in summer (Table 46). Very few individuals were sighted on steep terrain features either season.

Table 44. Seasonal use of topography by mule deer on the Foster Creek study area.

Topography Type	Spring	Summer
	1980	1980
	431 <u>1</u> /	355
Mesa-butte top	2 <u>2</u> /	1
Mesa-butte steep slopes	2	tr
Dissected mid-slopes	55	29
Alluvium/terrace	12	14
Flood plain	29	55

1/ Total individual observations

2/ Percent of total observations

Table 45. Seasonal use of exposure by mule deer on the Foster Creek study area.

Exposure	Spring 1980 431 ^{1/}	Summer 1980 355
North	10 ^{2/}	5
South	18	6
East	11	5
West	3	1
Northeast	7	7
Northwest	7	2
Southeast	3	2
Southwest	7	3
Flat	35	68

^{1/} Total individual observations

^{2/} Percent of total observations.

Table 46. Seasonal use of slope by mule deer on the Foster Creek study area.

Slope	Spring 1980 431 ^{1/}	Summer 1980 355
Flat	34 ^{2/}	68
Gentle	34	12
Medium	27	19
Steep	5	1

^{1/} Total individual observations

^{2/} Percent of total observations

White-tailed Deer

Twenty-one individual sightings of white-tailed deer were obtained in deciduous creekbottom habitats on the study area during the spring and summer of 1980.

Antelope

Population characteristics: Over 1100 antelope were observed on the study area during the first four and one half months of this study (Table 47). Numbers of antelope sighted, as well as mean group size, increased from spring through the summer. Numbers of antelope seen per hour of aerial survey was greatest in August (Table 41).

Summer population structure is presented in Table 48. The August surveys revealed 48.7 fawns per 100 does, indicating rather poor productive success this year.

Table 47. Mean group size for antelope on the Foster Creek and Sand Creek study areas.

Year	Month	Foster Creek			Sand Creek		
		No. Observ.	Total Indiv.	\bar{x}	No. Observ.	Total Indiv.	\bar{x}
1980	April	10	22	2.2	1	8	8.0
	May	58	198	3.4	1	3	3.0
	Spring	68	220	3.2	2	11	5.5
	June	103	331	3.2	10	16	1.6
	July	95	410	4.3	3	7	2.3
	Aug.	34	221	6.5	4	22	5.5
	Summer	232	962	4.1	17	45	2.6

Table 48. Antelope population structure on the Foster Creek study area, 1980.

Month	Number Classified				Population Structure (%)					
	Total	Bucks	Does	Fawns	Fawns:100 Does	Fawns:100 Adults	Bucks:100 Does	Bucks	Does	Fawns
June	308	100	167	41	24.6	15.4	59.9	32.5	54.2	13.3
July	395	103	198	94	47.5	31.2	52.0	26.1	50.1	23.8
Aug.	214	46	113	55	48.7	34.6	40.7	21.5	52.8	25.7

Vegetation type usage: The preponderance of antelope observations in the sagebrush/grassland types (84% in spring and 92% in summer) illustrates the dependence of this species upon these habitats (Table 49). The sagebrush subtype was most heavily used both seasons. Most summer sightings in the grassland subtype were on moist bog or swale sites. Use of ponderosa pine habitats by antelope was negligible.

Activity: Antelope activity at the time of observation was predominantly feeding in spring (74%), which decreased to 29 percent in the summer (Table 50). During summer, most antelope were standing alert (26%) or already running (32%) when first sighted.

Table 49. Seasonal use of vegetation types by antelope on the Foster Creek study area.

Vegetation Subtypes	Spring 1980 220 ^{1/}	Summer 1980 962
Ponderosa pine	-	-
Sagebrush	-	-
Grassland	1 ^{2/}	tr ^{3/}
Skunkbush	-	-
Juniper	-	-
Snowberry/rose	-	-
Total Ponderosa Pine	1	tr
Sagebrush	45	52
Deciduous shrub	1	tr
Grassland	38	40*
Total Sagebrush/Grassland	84	92
Deciduous tree	-	-
Shrub	12	2
Total Creekbottom	12	2
Ponderosa pine	-	-
Sagebrush/grassland	2	6
Creekbottom	-	tr
Total Agricultural	2	6

^{1/} Total individual observations

^{2/} Percent of total observations

^{3/} tr = trace; percentage less than 0.5

* 24 percent of observation were on wet bog or swale sites.

Use of topography: Use of topography appeared to be stable from season to season, with over half of all observations occurring on dissected mid-slopes (Table 51).

Use of exposure: Seasonal use of exposure by antelope is presented in Table 52. Flat terrain was the category containing the greatest proportion of sightings both seasons; 31 percent in spring and 38 percent during summer.

Use of slope: Most antelope sightings were made in habitats characterized by gentle slope or flat terrain (Table 53). Use of gentle and medium slopes decreased during summer as use of flat terrain increased.

Table 50 Seasonal activity of antelope on the Foster Creek study area.

Activity	Spring 1980 220 ^{1/}	Summer 1980 962
Standing	16 ^{2/}	26
Running	1	32
Bedded	8	11
Feeding	74	29
Walking	1	1

1/ Total individual observations

2/ Percent of total observations

Table 51. Seasonal use of topography by antelope on the Foster Creek study area.

Topography Type	Spring 1980 220 ^{1/}	Summer 1980 962
Dissected mid-slopes	57 ^{2/}	54
Alluvium/terrace	24	28
Flood plain	19	17

1/ Total individual observations

2/ Percent of total observations

Table 52. Seasonal use of exposure by antelope on the Foster Creek study area.

Exposure	Spring 1980 220 ^{1/}	Summer 1980 962
North	7 ^{2/}	9
South	7	10
East	10	4
West	12	6
Northeast	19	10
Northwest	2	8
Southeast	9	6
Southwest	3	9
Flat	31	38

1/ Total individual observations

2/ Percent of total observations

Table 53. Seasonal use of slope by antelope on the Foster Creek study area.

Slope	Spring	Summer
	1980 220 ¹ / ₂	1980 962
Flat	31 ² / ₂	40
Gentle	50	44
Medium	19	14
Steep	0	2

¹/ Total individual observations
²/ Percent of total observations

Sharp-tailed Grouse

Fifteen sharp-tailed grouse dancing grounds have been located on the Foster Creek study area (Table 54). Attendance by male birds averaged 22.1 per ground.

Five broods were observed on the study area, during the last week of July and August. Brood size range from two to five ($\bar{x} = 3.2$).

Sage Grouse

No sage grouse strutting grounds were found on the Foster Creek study area. However, 73 individual sightings of sage grouse were obtained on the study area during spring and summer of 1980. Two broods of five birds were observed in July.

Other Game Birds

Turkeys occur in the Foster Creek vicinity. Eighteen individuals were sighted on the study area during the summer season.

Ring-necked pheasants are ubiquitous and abundant on the study area. Five broods, ranging in size from four to eight ($\bar{x} = 5.8$) were observed during July.

Gray partridge occur on the study area but are seen infrequently. Eleven individuals were seen during the months of July and August, including one brood of three.

Table 54. Locations of sharp-tailed grouse dancing grounds on the Foster Creek study area and number of males attending, 1980.

Ground Number	UTM Coordinates	T	R	S	Number of Males Attending
1	4303, 50648	1S	47E	23 SE $\frac{1}{4}$ NW $\frac{1}{4}$	17
2	4288, 50678	1S	47E	10 NE $\frac{1}{4}$ SW $\frac{1}{4}$	25
3	4396, 50714	1N	48E	32 SE $\frac{1}{4}$ NE $\frac{1}{4}$	26
4	4367, 50716	1N	48E	31 SW $\frac{1}{4}$ NW $\frac{1}{4}$	23
5	4361, 50710	1N	47E	36 SE $\frac{1}{4}$	35+
6	4400, 50732	1N	48E	28 SW $\frac{1}{4}$ NW $\frac{1}{4}$	22
7	4388, 50766	1N	48E	17 E $\frac{1}{2}$ NW $\frac{1}{4}$	19
8	4362, 50785	1N	47E	12 N $\frac{1}{2}$ NE $\frac{1}{4}$	35
9	4287, 50740	1N	47E	20 SW $\frac{1}{4}$ SW $\frac{1}{4}$	4
10	4319, 50772	1N	47E	10 SW $\frac{1}{4}$ SW $\frac{1}{4}$	13
11	4293, 50805	2N	47E	32 SE $\frac{1}{4}$ SW $\frac{1}{4}$	17
12	4213, 50759	1N	46E	16 SE $\frac{1}{4}$ SW $\frac{1}{4}$	20
13	4323, 50694	1S	47E	1 W $\frac{1}{2}$ SE $\frac{1}{4}$	31
14	4304, 50715	1N	47E	33 NW $\frac{1}{4}$ SW $\frac{1}{4}$	No count
15	4393, 50668	1S	48E	15 NE $\frac{1}{4}$ NE $\frac{1}{4}$	No count

Waterfowl

Although most stock ponds on the study area were dry this year due to drought, eleven of the larger ones did support duck broods. Species breeding successfully included mallards, eared grebes, gadwalls, blue-winged teal and American widgeon. Two large reservoirs in the southern portion of the study area, and their associated marsh areas, support a large number and variety of resident waterfowl and shorebirds (Table 55). They also attract migrant species. The canvasback is listed as a migratory bird of high federal interest in the Powder River coal region (U.S.D.I. 1979).

Songbirds and Raptors

One hundred and seven species of birds, including game species, were observed on the Foster Creek study area (Table 55). The goshawk, ferruginous hawk, golden eagle, prairie falcon, peregrine falcon, upland sandpiper, long-billed curlew, mountain bluebird, Brewer's sparrow, and field sparrow are listed by Flath (1979) as species of special interest or concern. The ferruginous hawk, golden eagle, peregrine falcon, prairie falcon and long-billed curlew are listed as migratory birds of high federal interest in the Powder River coal region (U.S.D.I. 1979).

Table 55. Birds observed on the Foster Creek study area.

1. Common loon	55. Mourning dove
2. Eared grebe	56. Great horned owl
3. Western grebe	57. Poor-will
4. Pied-billed grebe	58. Common nighthawk
5. Great blue heron	59. Belted kingfisher
6. American bittern	60. Common flicker
7. Canada goose	61. Red-headed woodpecker
8. Mallard	62. Eastern kingbird
9. Gadwall	63. Western kingbird
10. Pintail	64. Say's phoebe
11. Green-winged teal	65. Least flycatcher
12. Blue-winged teal	66. Western wood pewee
13. American wigeon	67. Horned lark
14. Northern shoveler	68. Violet-green swallow
15. Redhead	69. Barn swallow
16. Ring-necked duck	70. Cliff swallow
17. Canvasback	71. Black-billed magpie
18. Lesser scaup	72. Common crow
19. Bufflehead	73. Pinyon jay
20. Ruddy duck	74. Black-capped chickadee
21. Goshawk	75. House wren
22. Red-tailed hawk	76. Rock wren
23. Rough-legged hawk	77. Brown thrasher
24. Ferruginous hawk	78. American robin
25. Golden eagle	79. Mountain bluebird
26. Marsh hawk	80. Townsend's solitaire
27. Prairie falcon	81. Loggerhead shrike
28. Peregrine falcon	82. Starling
29. American kestrel	83. Yellow warbler
30. Sharp-tailed grouse	84. Yellow-rumped warbler
31. Sage grouse	85. Common yellowthroat
32. Ring-necked pheasant	86. House sparrow
33. Gray partridge	87. Western meadowlark
34. Turkey	88. Yellow-headed blackbird
35. Virginia rail	89. Red-winged blackbird
36. Sora	90. Northern oriole
37. American coot	91. Brewer's blackbird
38. Killdeer	92. Common grackle
39. Black-bellied plover	93. Brown-headed cowbird
40. Common snipe	94. Black-headed grosbeak
41. Long-billed curlew	95. Lazuli bunting
42. Upland sandpiper	96. American goldfinch
43. Spotted sandpiper	97. Red crossbill
44. Solitary sandpiper	98. Rufous-sided towhee
45. Willet	99. Lark bunting
46. Lesser yellowlegs	100. Savannah sparrow
47. Long-billed dowitcher	101. Grasshopper sparrow
48. American avocet	102. Vesper sparrow
49. Wilson's phalarope	103. Lark sparrow
50. Northern phalarope	104. Chipping sparrow
51. California gull	105. Brewer's sparrow
52. Ring-billed gull	106. Field sparrow
53. Franklin's gull	107. Song sparrow
54. Black tern	

Species composition of birds observed during three spring runs of the roadside bird census route is presented in Table 56. These data are probably biased in favor of species having the most conspicuous habits and the loudest songs.

An active golden eagle nest, which fledged one young, was located in the north central portion of the study area in a pine tree. A pair of red-tailed hawks was known to nest in the central part of the study area and they were successful in rearing at least three young. Although ferruginous hawks and prairie falcons were observed sporadically on the study area, no nests or aeries were found. Two active great horned owl nests were found in sandstone outcrops.

Non-Game Mammals

Seventeen species of mammals were observed on the Foster Creek study area (Table 57). The black-tailed prairie dog is listed by Flath (1979) as a species of special interest or concern.

The results of small mammal sampling on the study area are presented in Table 58. The ponderosa pine and riparian habitats had the highest trapping success but only two species were captured.

Nineteen prairie dog towns are located within the boundary of the study area (Table 59). Mean town size is 16.7 hectares (41.8 acres). Ground surveys conducted during July failed to reveal evidence of black footed ferret or burrowing owl activity on any of these sites.

Amphibians and Reptiles

Eleven species of amphibians and reptiles were observed on the Foster Creek study area (Table 60). The snapping turtle, plains hognose and milk snake are listed by Flath (1979) as species of special interest or concern.

Sand Creek

Mule Deer

Population characteristics: Two hundred and forty-eight mule deer were observed on the Sand Creek study area during the first four and one half months of the study (Table 40). Deer were most readily observed during spring, when group size was at its peak. Aerial observations per hour of survey were fewer on the Sand Creek area than on Foster Creek during spring, but these figures were comparable during summer (Tables 41 and 61).

Table 56. Bird species composition from three runs of the bird inventory route on the Foster Creek study area, spring 1980.

Species	Number Observed	Percent Composition	Percent Frequency
1. Western meadowlark	127	31	90
2. Lark bunting	60	15	2
3. Vesper sparrow	59	14	53
4. Lark sparrow	18	4	23
5. Mourning dove	18	4	22
6. Chipping sparrow	16	4	22
7. Brewer's blackbird	15	4	15
8. Common grackle	8	2	7
9. Killdeer	8	2	12
10. Eastern kingbird	7	2	7
11. American robin	7	2	10
12. House wren	7	2	10
13. Yellow warbler	7	2	5
14. Red-winged blackbird	6	1	7
15. Horned lark	5	1	7
16. Pinyon jay	5	1	5
17. Brown headed cowbird	4	1	5
18. Say's phoebe	4	1	5
19. Black headed grosbeak	3	1	3
20. Brewer's sparrow	3	1	5
21. Rock wren	3	1	5
22. American goldfinch	2	+	2
23. Common flicker	2	+	3
24. Grasshopper sparrow	2	+	3
25. Least flycatcher	2	+	3
26. Violet-green swallow	2	+	2
27. American kestrel	1	+	2
28. Barn swallow	1	+	2
29. Lazuli bunting	1	+	2
30. Mountain bluebird	1	+	2
31. Starling	1	+	2
32. Western kingbird	1	+	2
33. Yellow rumped warbler	1	+	2
34. Yellowthroat	1	+	2

Table 57. Mammals observed on the Foster Creek study area.

1. Striped skunk	<i>Mephitis mephitis</i>
2. Badger	<i>Taxidea taxus</i>
3. Raccoon	<i>Procyon lotor</i>
4. Red fox	<i>Vulpes vulpes</i>
5. Coyote	<i>Canis latrans</i>
6. Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
7. Black-tailed prairie dog	<i>Cynomys ludovicianus</i>
8. Northern pocket gopher	<i>Thomomys talpoides</i>
9. Western deer mouse	<i>Peromyscus maniculatus</i>
10. Muskrat	<i>Ondatra zibethicus</i>
11. House mouse	<i>Mus musculus</i>
12. Porcupine	<i>Erethizon dorsatum</i>
13. White-tailed jack rabbit	<i>Lepus townsendii</i>
14. Desert cottontail	<i>Sylvilagus auduboni</i>
15. White-tailed deer	<i>Odocoileus virginianus</i>
16. Mule deer	<i>Odocoileus hemionus</i>
17. Pronghorn antelope	<i>Antilocapra americana</i>

Table 58. Results of small mammal trapping on the Foster Creek study area, summer 1980.

	Riparian	Ponderosa Pine	Sagebrush/ Grassland
Total captures	14	13	6
Trap nights	809	810	798
Captures/100 trap nights	1.73	1.60	0.75
Number of species caught	1	2	1
Species:			
<i>Peromyscus maniculatus</i>	14	12	6
<i>Mus musculus</i>		1	

Table 59. Prairie dog town locations and survey results, Foster Creek study area.

No.	UTM Coordinates	T	R	S	Hectares	Acres	Sign
1	4392, 50765	1N	48E	17 NE $\frac{1}{4}$	26	65	N.S. ¹
2	4408, 50757	1N	48E	16 S $\frac{1}{2}$	26	65	N.S.
3	4412, 50782	1N	48E	9 NE $\frac{1}{4}$	11	27.5	N.S.
4	4411, 50777	1N	48E	9 SE $\frac{1}{4}$	42	105	N.S.
5	4371, 50759	1N	48E	18 SW $\frac{1}{4}$	0.7	1.7	N.S.
6	4371, 50767	1N	48E	18 NW $\frac{1}{4}$	2	5	N.S.
7	4363, 50782	1N	47E	12 NE $\frac{1}{4}$	4	10	N.S.
8	4330, 50798	1N	47E	3 NE $\frac{1}{4}$	22.8	57.5	N.S.
9	4208, 50757	1N	46E	21 NW $\frac{1}{4}$	5.2	13	N.S.
10	4235, 50784	1N	46E	10 NE $\frac{1}{4}$	2.4	6	N.S.
11	4267, 50789	1N	46E	1 SE $\frac{1}{4}$	10	25	N.S.
12	4258, 50769	1N	46E	13 NW $\frac{1}{4}$	4	10	N.S.
13	4286, 50775	1N	47E	8 SW $\frac{1}{4}$	44	110	N.S.
14	4302, 50793	1N	47E	5 SE $\frac{1}{4}$	3	7.5	N.S.
15	4265, 50718	1N	46E	36 NE $\frac{1}{4}$	20	50	N.S.
16	4372, 50690	1S	48E	4 S $\frac{1}{2}$	82	205	N.S.
17	4311, 50699	1N	47E	2 E $\frac{1}{2}$	6	15	N.S.
18	4295, 50752	1N	47E	20 NE $\frac{1}{4}$	2.4	6	N.S.
19	4362, 50734	1N	47E	25 NE $\frac{1}{4}$	4	10	N.S.

N.S. = no sign of black-footed ferret or burrowing owls.

Table 60. Amphibians and reptiles observed on the Foster Creek study area.

1.	Rocky Mountain toad	<i>Bufo woodhousei</i>
2.	Leopard frog	<i>Rana pipiens</i>
3.	Snapping turtle	<i>Chelydra serpentina</i>
4.	Painted turtle	<i>Chrysemys picta</i>
5.	Short-horned lizard	<i>Phrynosoma douglassi</i>
6.	Plains hognose	<i>Heterodon nasicus</i>
7.	Racer	<i>Coluber constrictor</i>
8.	Bullsnake	<i>Pituophis catenifer</i>
9.	Milk snake	<i>Lampropeltis deliata</i>
10.	Plains garter snake	<i>Thamnophis radix</i>
11.	Prairie rattlesnake	<i>Crotalus viridis</i>

Vegetation type usage: Seasonal use of vegetation types by mule deer is presented in Table 62. Use of ponderosa pine habitats was undoubtedly underestimated, however 31 percent of spring observations were in this category. Use of creek-bottom habitats doubled from spring (21%) to summer (42%). An increase in use of sagebrush/grassland types was also noted.

Activity: Mule deer activity at the time of observation is presented in Table 63. Feeding activity decreased sharply from spring to summer.

Use of topography: Mule deer observations indicate that flood plain areas were the most heavily used during both seasons (Table 64). Unlike the Foster Creek area, use of steeper terrain features on Sand Creek remained substantial throughout the summer.

Use of exposure: Use of flat terrain increased substantially from spring to summer (Table 65), with more than half of all summer sightings in this category. North exposures received substantial use in spring.

Use of slope: The percentage of mule deer observations on flat terrain increased from 48 percent during spring to 64 percent in summer (Table 66). Deer on the Sand Creek study area exhibit a greater tendency to use steep terrain than do those on Foster Creek (Table 46).

White-tailed Deer

Nine individual sightings of white-tailed deer were obtained in deciduous creekbottom habitats on the study area during spring and summer of 1980.

Antelope

Population characteristics: Few antelope observations were made on the Sand Creek study area (Table 47). Suitable antelope habitat is limited due to the large proportion of the study area under cultivation. Observations per hour of aerial survey were very low (Table 61).

Antelope observations made on the periphery of the study area were inadequate to determine population structure for the area (Table 67).

Vegetation type usage: All spring antelope observations were made in sagebrush/grassland types (Table 68). Summer sightings were evenly distributed between the sagebrush/grassland and agricultural habitat categories.

Table 61. Mule deer, antelope and coyote aerial observations per hour on the Sand Creek study area.

Year	Month	Hours	Aerial Observ.			Observ./Hour			Coyotes/100:	
			Mule	Deer	Ant. Coyote	Mule	Deer	Ant. Coyote	Mule	Ant.
1980	April	2.5	37	8	0	14.8	3.2	0	0	0
	May	1	62	3	1	62	3	1	1.6	33.3
	Spring	3.5	99	11	1	28.3	3.1	0.3	1	9
	June	2.5	32	5	0	12.8	2	0	0	0
	July	2	42	5	0	21	2.5	0	0	0
	Aug.	1	47	16	1	47	16	1	2.1	6.2
	Summer	5.5	121	26	1	22	4.7	0.2	0.3	3.8

Table 62. Seasonal use of vegetation types by mule deer on the Sand Creek study area.

Vegetation Subtypes	Spring 1980 105 ¹ / ₁	Summer 1980 143
Ponderosa pine	12 ² / ₂	10
Sagebrush	5	-
Grassland	14	3
Skunkbush	-	-
Juniper	-	-
Snowberry/Rose	-	1
Total Ponderosa pine	31	14
Sagebrush	17	31
Deciduous shrub	-	-
Grassland	3	1
Total Sagebrush/Grassland	20	32
Deciduous tree	-	6
Shrub	21	36
Total Creekbottom	21	42
Ponderosa pine	-	-
Sagebrush/grassland	18	7
Creekbottom	10	6
Total Agricultural	28	13

¹/ Total individual observations

²/ Percent of total observations

Table 63. Seasonal activity of mule deer on the Sand Creek study area.

Activity	Spring 1980 105 <u>1</u> /	Summer 1980 143
Standing	39 <u>2</u> /	70
Running	14	10
Bedded	-	9
Feeding	34	8
Walking	12	3

1/ Total individual observations

2/ Percent of total observations

Table 64. Seasonal use of topography by mule deer on the Sand Creek study area.

Topography Type	Spring 1980 105 <u>1</u> /	Summer 1980 143
Mesa-butte steep side slopes	14 <u>2</u> /	19
Dissected mid-slopes	20	17
Alluvium/terrace	35	16
Flood plain	30	48

1/ Total individual observations

2/ Percent of total observations

Table 65. Seasonal use of exposure by mule deer on the Sand Creek study area.

Exposure	Spring 1980 105 <u>1</u> /	Summer 1980 143
North	30 <u>2</u> /	1
South	2	17
East	-	-
West	-	7
Northeast	6	9
Northwest	-	2
Southeast	-	1
Southwest	15	1
Flat	48	63

1/ Total individual observations

2/ Percent of total observations

Table 66. Seasonal use of slope by mule deer on the Sand Creek study area.

Slope	Spring 1980	Summer 1980
	105 ^{1/}	143
Flat	48 ^{2/}	64
Gentle	23	12
Medium	15	12
Steep	14	11

1/ Total individual observations

2/ Percent of total observations

Table 67. Antelope population structure on the Sand Creek study area, 1980.

Month	Total Classified				Fawns:100		Bucks: 100	Population Structure (%)		
	Total	Bucks	Does	Fawns	Does	Adults	Does	Bucks	Does	Fawns
June	16	6	10	0	0.0	0.0	60.0	37.5	62.5	0.0
July	7	0	4	3	75.0	75.0	0.0	0.0	57.1	42.9
Aug.	22	3	8	11	137.5	100.0	37.5	13.6	36.4	50.0

Activity: Feeding activity was prevalent (73%) for spring antelope observations (Table 69). Feeding activity declined substantially during summer with a corresponding increase in other activities.

Use of topography: Use of dissected mid-slopes by antelope decreased from spring to summer accompanied by an increase in use of flood-plain areas (Table 70).

Use of exposure: Seasonal use of exposure by antelope is presented in Table 71. Flat terrain was the category containing the greatest proportion of sightings during both seasons; 73 percent in spring and 78 percent in summer.

Use of slope: Nearly all antelope were observed in habitats characterized by gentle slope or flat terrain (Table 72).

Table 68. Seasonal use of vegetation types by antelope on the Sand Creek study area.

Vegetation Subtypes	Spring 1980 111/	Summer 1980 45
Ponderosa pine	-	-
Sagebrush	-	-
Grassland	-	-
Skunkbush	-	-
Juniper	-	-
Snowberry/Rose	-	-
Total Ponderosa pine	-	-
Sagebrush	73 ^{2/}	27
Deciduous shrub	-	-
Grassland	27	24
Total Sagebrush/Grassland	100	51
Deciduous tree	-	-
Shrub	-	-
Total Creekbottom	-	-
Ponderosa pine	-	-
Sagebrush/Grassland	-	42
Creekbottom	-	7
Total Agricultural	-	49

1/ Total individual observations

2/ Percent of total observations

Table 69. Seasonal activity of antelope on the Sand Creek study area.

Activity	Spring 1980 111/	Summer 1980 45
Standing	-	29 ^{2/}
Running	27	36
Bedded	-	13
Feeding	73	20
Walking	-	2

1/ Total individual observations

2/ Percent of total observations

Table 70. Seasonal use of topography by antelope on the Sand Creek study area.

Topography Type	Spring 1980 11 <u>1</u> /	Summer 1980 45
Dissected mid-slopes	27 <u>2</u> /	16
Alluvium/terrace	73	69
Flood plain	-	16
1/ Total individual observations		
2/ Percent of total observations		

Table 71. Seasonal use of exposure by antelope on the Sand Creek study area.

Exposure	Spring 1980 11 <u>1</u> /	Summer 1980 45
North	-	2 <u>2</u> /
South	-	11
East	-	-
West	-	-
Northeast	27	7
Northwest	-	-
Southeast	-	-
Southwest	-	2
Flat	73	78
1/ Total individual observations		
2/ Percent of total observations		

Table 72. Seasonal use of slope by antelope on the Sand Creek study area.

Slope	Spring 1980 11 <u>1</u> /	Summer 1980 45
Flat	73 <u>2</u> /	78
Gentle	27	16
Medium	-	4
Steep	-	2
1/ Total individual observations		
2/ Percent of total observations		

Sharp-tailed Grouse

Nine sharp-tailed grouse dancing grounds have been located on the Sand Creek study area (Table 73). Attendance by male birds averaged 14.3 per ground. One brood of four was seen during July.

Sage Grouse

No sage grouse strutting grounds were found on the Sand Creek study area. However, 32 individual observations of sage grouse were made on the area during spring and summer of 1980. No broods were observed.

Other Game Birds

Turkeys occur on the Sand Creek area, associated with ponderosa pine habitats. Forty individuals were sighted on the study area during the spring and summer seasons.

Ring-necked pheasants are common on the study area. One brood of four was observed in July.

Gray partridge occur on the study area but are seen infrequently. Eight individuals were sighted during August.

Songbirds and Raptors

Sixty-six species of birds, including game species, were observed on the Sand Creek study area (Table 74). The Swainson's hawk, ferruginous hawk, golden eagle, prairie falcon, merlin, upland sandpiper, long-billed curlew, long-eared owl, mountain bluebird and field sparrow are listed by Flath (1979) as species of special interest or concern. The ferruginous hawk, golden eagle, prairie falcon, long-billed curlew and merlin are also listed as migratory birds of high federal interest in the Powder River coal region (U.S.D.I. 1979).

Species composition of birds observed during three spring runs of the roadside bird census route is presented in Table 75. These data are probably biased in favor of species having the most conspicuous habits and the loudest songs.

Three active merlin nests were located on the periphery of the study area. All three pairs utilized old magpie nests in ponderosa pine trees. One nest fledged one young. No production data were obtained for the other two nests.

Golden eagles were frequently observed in the study area and adjacent vicinity. The study area lies within the territory of at least one pair of eagles, but no nests were found. Immature birds were also observed on the area during spring and summer.

Table 73. Locations of sharp-tailed grouse dancing grounds on the Sand Creek study area and number of males attending, 1980.

Ground No.	UTM Coordinates	T	R	S	No. Males Attending
1	4538, 50729	1N	49E	26 C	10
2	4575, 50692	1S	50E	3 NW $\frac{1}{4}$ SW $\frac{1}{4}$	13
3	4565, 50655	1S	50E	16 SW $\frac{1}{4}$ SE $\frac{1}{4}$	8
4	4550, 50696	1S	49E	5 SW $\frac{1}{4}$ NE $\frac{1}{4}$	10
5	4547, 50716	1N	49E	36 NW $\frac{1}{4}$ NW $\frac{1}{4}$	16
6	4541, 50689	1S	49E	5 SW $\frac{1}{4}$ SW $\frac{1}{4}$	22
7	4544, 50661	1S	49E	17 N $\frac{1}{2}$ SW $\frac{1}{4}$	22
8	4532, 50739	1N	49E	23 SW $\frac{1}{4}$ SW $\frac{1}{4}$	19
9	4590, 50686	1S	50E	2 SW $\frac{1}{4}$ SW $\frac{1}{4}$	9

Table 74. Birds observed on the Sand Creek study area.

1. Mallard	34. Horned lark
2. Gadwall	35. Barn swallow
3. Blue-winged teal	36. Cliff swallow
4. American widgeon	37. Black-billed magpie
5. Red-tailed hawk	38. Pinyon jay
6. Swainson's hawk	39. Black-capped chickadee
7. Rough-legged hawk	40. House wren
8. Ferruginous hawk	41. Rock wren
9. Golden eagle	42. Brown thrasher
10. Marsh hawk	43. American robin
11. Prairie falcon	44. Mountain bluebird
12. Merlin	45. Townsend's solitaire
13. American kestrel	46. Loggerhead shrike
14. Sharp-tailed grouse	47. Starling
15. Sage grouse	48. Yellow warbler
16. Ring-necked pheasant	49. House sparrow
17. Gray partridge	50. Western meadowlark
18. Turkey	51. Yellow-headed blackbird
19. Killdeer	52. Red-winged blackbird
20. Long-billed curlew	53. Northern oriole
21. Upland sandpiper	54. Brewer's blackbird
22. Wilson's phalarope	55. Common grackle
23. Mourning dove	56. Brown-headed cowbird
24. Great-horned owl	57. American goldfinch
25. Long-eared owl	58. Red crossbill
26. Poor-will	59. Rufous-sided towhee
27. Common nighthawk	60. Lark bunting
28. Common flicker	61. Grasshopper sparrow
29. Red-headed woodpecker	62. Vesper sparrow
30. Eastern kingbird	63. Lark sparrow
31. Western kingbird	64. Chipping sparrow
32. Say's phoebe	65. Field sparrow
33. Western wood pewee	66. Song sparrow

Ferruginous hawks were seen on the study area during May and June, but no active nests were found. Several inactive ferruginous nests were located on the study area and in the immediate vicinity, some of which were probably used in recent years. Red-tailed hawks and marsh hawks were commonly observed, but no nests were found.

Table 75. Bird species composition from three runs of the bird inventory route on the Sand Creek study area, spring 1980.

Species	Number Observed	Percent Composition	Percent Frequency
Western meadowlark	90	32	80
Brewer's blackbird	41	15	16
Vesper sparrow	31	11	38
Red-winged blackbird	21	8	16
Mourning dove	11	4	16
Chipping sparrow	9	3	16
Barn swallow	8	3	4
Brown-headed cowbird	7	2	9
Lark sparrow	7	2	11
American robin	6	2	9
Eastern kingbird	6	2	9
House wren	6	2	9
Grasshopper sparrow	5	2	11
Killdeer	5	2	11
Rufous-sided towhee	3	1	7
Upland sandpiper	3	1	4
Yellow warbler	3	1	7
Common grackle	2	1	4
Common flicker	2	1	4
Horned lark	2	1	2
Pinyon jay	2	1	4
Say's phoebe	2	1	4
Western wood pewee	2	1	4
Brown thrasher	1	+	2
Common nighthawk	1	+	2
Field sparrow	1	+	2
Rock wren	1	+	2

Non-Game Mammals

Fourteen species of mammals were observed on the Sand Creek study area (Table 76). The black-tailed prairie dog is listed by Flath (1979) as a species of special interest or concern.

The results of small mammal sampling on the study area are presented in Table 77. The highest trapping success was on the ponderosa pine sites. The largest number of species were captured in the ponderosa pine type.

Table 76. Mammals observed on the Sand Creek study area.

1. Striped skunk	<i>Mephitis mephitis</i>
2. Coyote	<i>Canis latrans</i>
3. Bobcat	<i>Lynx rufus</i>
4. Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
5. Least chipmunk	<i>Eutamias minimus</i>
6. Northern pocket gopher	<i>Thomomys talpoides</i>
7. Western deer mouse	<i>Peromyscus maniculatus</i>
8. House mouse	<i>Mus musculus</i>
9. Porcupine	<i>Erethizon dorsatum</i>
10. White-tailed jack rabbit	<i>Lepus townsendii</i>
11. Desert cottontail	<i>Sylvilagus auduboni</i>
12. White-tailed deer	<i>Odocoileus virginianus</i>
13. Mule deer	<i>Odocoileus hemionus</i>
14. Pronghorn antelope	<i>Antilocapra americana</i>

Table 77. Results of small mammal trapping on the Sand Creek study area, summer 1980.

	Riparian	Ponderosa Pine	Sagebrush/ Grassland
Total captures	3	20	7
Trap nights	828	896	881
Captures/100 trap nights	0.36	2.23	0.79
Number of species caught	1	3	2
Species:			
<i>Peromyscus maniculatus</i>	3	18	6
<i>Mus musculus</i>		1	
<i>Eutamias minimus</i>		1	
<i>Spermophilus tridecemlineatus</i>			1

Amphibians and Reptiles

Five species of amphibians and reptiles were observed on the Sand Creek study area (Table 78).

Table 78. Amphibians and reptiles observed on the Sand Creek study area.

1. Leopard frog	<i>Rana pipiens</i>
2. Painted turtle	<i>Chrysemys picta</i>
3. Racer	<i>Coluber constrictor</i>
4. Bullsake	<i>Pituophis catenifer</i>
5. Prairie rattlesnake	<i>Crotalus viridis</i>

Birney

Mule Deer

Population characteristics: During the first five months of the study 109 mule deer were observed. The average group size was highest in spring and lowest in summer (Table 79). Mule deer observations per hour of aerial survey were highest in May and lower during the summer months (Table 80).

Table 79. Average group size of mule deer in the Birney, Kirby, and Tongue River Dam areas.

Month	<u>Birney</u>			<u>Kirby</u>			<u>Tongue River Dam</u>		
	No. Groups	No. Deer	Average	No. Groups	No. Deer	Average	No. Groups	No. Deer	Average
April	7	35	5.0	18	157	8.7	0	0	0
May	14	39	2.8	20	62	3.1	10	37	3.7
Spring	21	74	3.5	38	219	5.8	10	37	3.7
June	5	6	1.2	9	12	1.3	11	21	1.9
July	7	16	2.3	16	32	2.0	17	32	1.9
Aug.	6	13	2.2	8	19	2.4	35	81	2.3
Summer	18	35	1.9	33	63	1.9	63	134	2.1

Table 80. Mule deer and coyote aerial observations per hour in the Birney study area.

Month	Hours	<u>Aerial Observ.</u>		<u>Observ./Hour</u>		Coyotes/ 100 Mule Deer
		Mule Deer	Coyotes	Mule Deer	Coyotes	
May	1.4	30	2	21.4	1.4	6.7
June	1.2	5	1	4.2	0.3	20
July	1.9	16	0	8.4	0	0
Aug.	1.6	13	6	8.1	3.7	46.2
Summer	4.7	34	7	7.2	1.5	20.6

Use of vegetation: Sagebrush habitat was the most heavily used type during both seasons (Table 81). These results may be biased because it was easier to observe deer in sagebrush areas than in the ponderosa pine vegetation types. The use of ponderosa pine areas was higher in summer than in spring. Use of riparian habitat was small and limited to summer.

Activity: Most of the deer were feeding when observed during both seasons (Table 82). This mainly was because the aerial surveys were conducted just after sunrise when deer are usually feeding.

Table 81. Seasonal use of vegetation by mule deer in the Birney, Kirby, and Tongue River Dam areas.

Vegetation Subtypes	Birney		Kirby		Tongue River Dam	
	Spring	Summer	Spring	Summer	Spring	Summer
Ponderosa Pine						
Ponderosa pine	7%	0%	7%	2%	0%	0%
Big sage	7	29	5	2		1
Grassland	3	9	14	17		4
Skunkbush	3			13		2
Juniper			2		22	4
Grassland						
Big sage	81	51	29	2	19	12
Silver sage			5			
Grassland			35	14	57	7
Skunkbush						4
Riparian						
Deciduous tree			1	8	3	9
Deciduous shrub		3		43		29
Grass-sedge						5
Mud-flat forbs						1
Hayfield			2			
Juniper						
Juniper						2
Sagebrush		7				2
Skunkbush						14
Total No. of Observations	74	35	201	63	37	134

Table 82. Seasonal activity of mule deer in the Birney, Kirby, and Tongue River Dam areas.

Activity	Birney		Kirby		Tongue River Dam	
	Spring	Summer	Spring	Summer	Spring	Summer
Standing	1%	0%	0%	0%	16%	4%
Running	4	3	9	5	3	8
Lying	0	6	4	2	3	3
Feeding	95	91	85	75	78	77
Walking	0	0	2	19	0	8
Total No. Observations	74	35	201	63	37	134

Use of topography: Most of the deer were observed on dissected mid-slopes during the spring (Table 83). Use of mesa-butte tops increased from spring to summer. This may reflect a general movement upward in elevation during the summer. This also may have been biased because the mesa-butte tops were generally covered by open sagebrush or grassland habitat in which deer were easier to observe.

Table 83. Seasonal use of topography by mule deer in the Birney, Kirby, and Tongue River dam areas.

Topography	Birney		Kirby		Tongue River Dam	
	Spring	Summer	Spring	Summer	Spring	Summer
Mesa-butte top	18%	43%	5%	5%	22%	7%
Steep side-slope	0	0	1	19	0	2
Dissected mid-slope	82	51	88	73	43	41
Alluvium	0	6	4	0	32	7
Flood plain	0	0	2	3	3	43
Total No. of observations	74	35	201	63	37	134

Use of slope: Most of the deer observed in spring were using gentle and medium slopes (Table 84). During the summer the deer use was evenly split between flat and medium slopes. Use of flat slopes was usually associated with mesa-butte tops.

Table 84. Seasonal use of slope by mule deer in the Birney, Kirby, and Tongue River Dam areas.

Slope	Birney		Kirby		Tongue River Dam	
	Spring	Summer	Spring	Summer	Spring	Summer
Flat	11%	40%	11%	5%	57%	43%
Gentle	47	11	7	36	19	26
Medium	39	49	82	57	24	24
Steep	3	0	0	2	0	2
Total No. of observations	74	35	201	63	37	134

Use of exposure: East-facing slopes were more heavily used during spring (Table 85). Flat areas and east slopes were heavily used during summer.

Table 85. Seasonal use of exposure by mule deer in the Birney, Kirby, and Tongue River Dam areas.

Exposure	Birney		Kirby		Tongue River Dam	
	Spring	Summer	Spring	Summer	Spring	Summer
No. Exposure (Flat)	20%	40%	11%	5%	57%	48%
North	4	9	9	10	16	2
South	4	14	5	29	0	12
East	40	23	9	16	2	4
West	0	6	1	6	22	6
Northeast	16	6	5	6	0	10
Northwest	1	0	2	11	0	3
Southeast	0	3	11	13	2	3
Southwest	14	0	47	5	0	12
Total No. of Observations	74	35	201	63	37	134

White-tailed Deer

Twelve whitetail deer were sighted in the Birney study area during the summer in 1980. All were feeding in hayfields along the Tongue River near Birney.

Antelope

Six antelope were sighted on the Birney study area in spring (Table 86). All were in sagebrush vegetation in areas of gentle slope. The Birney study area was too rugged to be extensively used by antelope.

Table 86. Average group size of antelope in the Birney, Kirby, and Tongue River Dam study areas.

Month	Birney			Kirby			Tongue River Dam		
	No. Group	No. Ant.	Ave. Group Size	No. Group	No. Ant.	Ave. Group Size	No. Group	No. Ant.	Ave. Group Size
April	2	6	3.0	7	35	5.0	1	13	13.0
May				11	38	3.4	6	27	4.5
Spring	2	6	3.0	18	73	4.1	7	40	5.7
June				9	22	2.4	3	7	2.3
July				6	24	4.0	6	18	3.0
Aug.				4	15	3.8	7	37	5.3
Summer				19	61	3.2	16	62	3.9

Sharp-tailed Grouse

Two sharp-tailed grouse dancing grounds were located in the Birney study area (Table 87). Attendance averaged 11.3 birds per ground. A third ground with five males was suspected, but the birds were never observed dancing.

Ring-necked Pheasant

Ring-necked pheasants were common along the Tongue River adjacent to the Birney study area. They were occasionally seen on Cook Creek in the study area.

Turkey

Turkeys are known to occur on the Birney study area and some were observed during fall 1980. However, no turkeys were observed during spring or summer.

Table 87. Sharp-tailed grouse dancing grounds in the Birney Study area and number of males attending in 1980.

Ground Number	Location			Number of Males Observed 1980
	T	R	S	
1	6S	42E	9 N $\frac{1}{2}$	5
2	5S	41E	29 NE $\frac{1}{4}$	18

Waterfowl

Waterfowl species found breeding within the study area during 1980 included mallards and American widgeon. Canada geese, green winged teal, blue-winged teal, northern shovelers, wood ducks, redheads, and lesser scaup were observed as spring or late summer migrants.

Below average precipitation during the fall and winter of 1979 and during the spring of 1980 left most stock ponds on the area dry or with low water levels. Three stock ponds near the head of Cook Creek in the northwest corner of the study area held water throughout the summer and appeared to be the most important ponds on the study area in terms of waterfowl production. One of these three ponds produced three broods of mallards and one brood of widgeon. No other duck broods were observed on the study area.

Table 88. Bird species observed on the Birney study area.

1. Great blue heron	39. Violet-green swallow
2. Canada goose	40. Tree swallow
3. Mallard	41. Barn swallow
4. Gadwall	42. Cliff swallow
5. Green-winged teal	43. Black-billed magpie
6. Blue-winged teal	44. Pinyon jay
7. American wigeon	45. Clark's nutcracker
8. Northern shoveler	46. Black-capped chickadee
9. Wood duck	47. White-breasted nuthatch
10. Lesser scaup	48. Red-breasted nuthatch
11. Turkey vulture	49. House wren
12. Red-tailed hawk	50. Canyon wren
13. Marsh hawk	51. Rock wren
14. Prairie falcon	52. Gray catbird
15. American kestrel	53. American robin
16. Sharp-tailed grouse	54. Mountain bluebird
17. Ring-necked pheasant	55. Townsend's solitaire
18. Turkey	56. Cedar waxwing
19. Killdeer	57. Solitary vireo
20. Common snipe	58. Yellow warbler
21. Upland sandpiper	59. Yellow-rumped warbler
22. Spotted sandpiper	60. Western meadowlark
23. Solitary sandpiper	61. Red-winged blackbird
24. Lesser yellowlegs	62. Northern oriole
25. Semipalmated sandpiper	63. Brewer's blackbird
26. Mourning dove	64. Common grackle
27. Great-horned owl	65. Brown-headed cowbird
28. Common nighthawk	66. American goldfinch
29. White-throated swift	67. Red crossbill
30. Belted kingfisher	68. Rufous-sided towhee
31. Common flicker	69. Lark bunting
32. Red-headed woodpecker	70. Vesper sparrow
33. Lewis' woodpecker	71. Lark sparrow
34. Eastern kingbird	72. Dark-eyed junco
35. Western kingbird	73. Chipping sparrow
36. Cassin's kingbird	74. Brewer's sparrow
37. Say's phoebe	75. White-crowned sparrow
38. Western wood pewee	76. Song sparrow

Songbirds and Raptors

Seventy-six species of birds, including game species, were observed on the study area (Table 88). The prairie falcon, upland sandpiper, mountain bluebird, and Brewer's sparrow were listed by Flath (1979) as species of special interest or concern in Montana.

Table 89 lists the species composition and frequency of observation of the bird species observed during three runs of the road route. A total of 358 birds and 28 species were recorded. Western meadowlarks made up nearly a third of the birds seen. Vesper sparrows, chipping sparrows, and rufous-sided towhees were also common.

Six species of raptors (including owls) were found on the study area. American kestrels were the most common of the raptors. Three active red-tailed hawk nests were located in cottonwood trees along the Tongue River near the study area. Several pairs of red-tailed hawks were suspected to have nested in the study area. One active prairie falcon aerie was located in the study area. No production data were obtained for any of the nests. Turkey vultures were commonly observed in the study area. A group of about ten to fifteen vultures used a daytime roosting area on the Tongue River near Whitten Creek. Many suitable nest sites for turkey vultures were found in the study area along cliffs and in dead trees. Marsh hawks and great horned owls were also observed in the study area.

Non-Game Mammals

Seventeen species of mammals were observed on the Birney study area (Table 90). Mink (*Mustela vison*) and yellowbelly marmots (*Marmota flaviventris*) were observed near the study area. Table 91 lists the results of small-mammal trapping in the study area. Deer mice were the most common small mammal caught. Traplines in rocky areas by cliffs had the highest trapping success, and riparian areas had the lowest trapping success.

Kirby

Mule Deer

Population characteristics: During April-August 1980, 282 mule deer were observed on the Kirby area. The average group size was highest in spring and lowest in summer (Table 79). Mule deer observations per hour of aerial survey were highest in May and lower during the summer months (Table 92).

Table 89. Bird species composition and frequency from three census runs of the road route on the Birney study area.

Species	Number Observed	Percent Composition*	Percent Frequency
Western meadowlark	115	32	83
Vesper sparrow	40	11	38
Chipping sparrow	60	17	53
Brewer's sparrow	5	1	7
Lark sparrow	18	5	17
Lark bunting	1	+	2
Rufous-sided towhee	23	6	30
American robin	10	3	15
Sav's phoebe	2	1	3
Western wood pewee	4	1	3
Western kingbird	7	2	7
Cassin's kingbird	1	+	2
Eastern kingbird	4	1	5
House wren	17	5	20
Rock wren	3	1	3
Black-capped chickadee	1	+	2
Yellow warbler	7	2	8
Yellow-rumped warbler	3	1	5
Mountain bluebird	5	1	8
Brown-headed cowbird	7	2	7
Red-winged blackbird	7	2	10
Brewer's blackbird	4	1	3
Common flicker	2	1	3
Upland sandpiper	2	1	3
Northern oriole	3	1	3
Common grackle	3	1	5
Tree swallow	2	1	2
Violet-green swallow	2	1	2

* + = less than 1%

Table 90. Mammals observed on the Birney study area.

1. Raccoon	<i>Procyon lotor</i>
2. Coyote	<i>Canis latrans</i>
3. Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
4. Least chipmunk	<i>Eutamias minimus</i>
5. Red squirrel	<i>Tamiasciurus hudsonicus</i>
6. Northern pocket gopher	<i>Thomomys talpoides</i>
7. Wyoming pocket mouse	<i>Perognathus fasciatus</i>
8. Beaver	<i>Castor canadensis</i>
9. Deer mouse	<i>Peromyscus maniculatus</i>
10. Bushytail woodrat	<i>Neotoma cinerea</i>
11. Muskrat	<i>Ondatra zibethicus</i>
12. Porcupine	<i>Erethizon dorsatum</i>
13. Desert Cottontail	<i>Sylvilagus audubonii</i>
14. Mule deer	<i>Odocoileus hemionus</i>
15. Whitetail deer	<i>Odocoileus virginianus</i>
16. Pronghorn antelope	<i>Antilocapra americana</i>
17. Striped skunk	<i>Mephitis mephitis</i>

Table 91. Results of small-mammal trapping in the Birney study area.

	Riparian	Ponderosa Pine-Juniper	Sagebrush	Cliff Area
Total captures	2	7	6	9
Trap nights	753	812	758	405
Captures/100 trap nights	0.3	0.9	0.8	2.2
Number of species caught	1	2	2	1
Species:				
<i>Peromyscus maniculatus</i>	2	5	5	9
<i>Eutamias minimus</i>		2		
<i>Perognathus fasciatus</i>			1	

Table 92. Mule deer, antelope and coyote aerial observations per hour in the Kirby study area.

Month	Hours	Aerial Observ.			Observ./Hour			Coyotes/100:	
		Mule Deer	Ant.	Coyote	Mule Deer	Ant.	Coyote	Mule Deer	Ant.
May	2.3	30	22	2	13.0	9.6	0.9	6.7	9.1
June	2.2	12	16	4	5.5	7.3	1.8	33.3	25.0
July	2.8	29	24	7	10.4	8.6	2.5	24.1	29.2
Aug.	2.6	16	13	1	6.2	5.0	0.4	6.2	7.7
Summer	7.6	57	53	12	7.5	7.0	1.6	21.1	22.6

Use of vegetation: Grassland and sagebrush habitats were the most heavily used habitats during spring (Table 81). Riparian habitats were the most heavily used habitats in summer. Ponderosa pine habitats received heavier use in summer than in spring.

Activity: Most of the deer were feeding when observed (Table 82).

Use of topography: Most mule deer were observed on dissected mid-slopes during both seasons (Table 83). Steep side slopes received higher use in summer than in spring.

Use of slope: Most of the mule deer were observed on medium slopes during both seasons (Table 84). Gentle slopes also received substantial use in summer.

Use of exposure: Southwest facing slopes and flat areas were heavily used in spring (Table 85). Mule deer were fairly evenly spread over all exposures during summer.

Whitetail Deer

Four whitetail deer were observed feeding in ponderosa pine-juniper habitat near the Tongue River during spring. Nine whitetail deer were observed feeding in riparian habitat along the Tongue River during summer.

Antelope

Population characteristics: During April-August 1980, 134 antelope were observed on the Kirby study area. They mostly occupied the high plateaus in the western portion of the study area. The average group size was highest in spring and lowest in summer (Table 86). During July 66.7 fawns per 100 does were observed (Table 93). Antelope observations per hour of aerial survey were highest in May and lowest in August (Table 92). The antelope aerial observations per hour are deceptively low since much of the study area covered was not suitable antelope habitat.

Use of vegetation: Most of the antelope observed were in grassland and sagebrush habitat (Table 94). Antelope were occasionally observed in hayfields.

Activity: Most antelope were feeding or running when observed (Table 95). They were very sensitive to disturbance from the airplane, so natural activity was hard to observe.

Use of topography: Most of the antelope were observed on mesa-butte tops and dissected mid-slopes (Table 96). Mesa-butte tops in the western portion of the study area were the main areas which were flat enough to be suitable for antelope.

Use of slope: Most of the antelope were observed on flat or gentle slopes (Table 97).

Use of exposure: Antelope were observed using all exposures except northwest exposures (Table 98). They probably were not selecting particular exposures since they were usually found on gentle slopes and flat areas where exposure is not significant.

Table 93. Antelope population characteristics in the Kirby study area.

Month	Number Classified				Fawns:100		Bucks:	Pop. Structure (%)		
	Total	Bucks	Does	Fawns	Does	Adults	100 Does	Bucks	Does	Fawns
June	16	6	9	1	11.1	6.3	66.7	37.5	56.2	6.3
July	22	12	6	4	66.7	18.2	200.0	54.5	27.3	18.2
Aug.	15	6	7	2	28.6	13.3	85.7	40.0	46.7	13.3

Table 94. Seasonal use of vegetation types by antelope in the Kirby and Tongue River Dam areas.

Vegetation Type	Kirby		Tongue River Dam	
	Spring	Summer	Spring	Summer
Sagebrush	28%	40%	20%	21%
Grassland	64	50	80	66
Deciduous shrub	0	5	0	0
Hayfield	0	5	0	0
Juniper-sagebrush	0	0	0	13
Ponderosa pine-grassland	6	0	0	0
Total No. of Observations	67	58	40	62

Table 95. Seasonal activity of antelope in the Kirby and Tongue River Dam areas.

Activity	Kirby		Tongue River Dam	
	Spring	Summer	Spring	Summer
Standing	6%	10%	3%	2%
Running	52	59	77	79
Lying	8	0	0	5
Feeding	34	31	20	14
Total No. of Observations	67	58	40	62

Table 96. Seasonal use of topography by antelope in the Kirby and Tongue River Dam areas.

Topography	Kirby		Tongue River Dam	
	Spring	Summer	Spring	Summer
Mesa-butte top	16%	24	0%	0%
Dissected mid-slope	76	76	22	64
Alluvium	8	0	78	36
Total No. of Observations	67	58	40	62

Table 97. Seasonal use of slope by antelope in the Kirby and Tongue River Dam areas.

Slope	Kirby		Tongue River Dam	
	Spring	Summer	Spring	Summer
Flat	9%	19%	78%	36%
Gentle	60	52	22	11
Medium	31	29	0	53
Steep	0	0	0	0
Total no. of Observations	67	58	40	62

Table 98. Seasonal use of exposure by antelope in the Kirby and Tongue River Dam areas.

Exposure	Kirby		Tongue River Dam	
	Spring	Summer	Spring	Summer
No. exposure (flat)	9%	19%	78%	36%
North	3	12	0	14
South	30	26	22	19
East	12	7	0	5
West	4	3	0	5
Northeast	3	14	0	0
Northwest	0	0	0	0
Southeast	21	3	0	21
Southwest	18	16	0	0
Total No. of Observations	67	58	40	62

Sharp-tailed Grouse

Thirteen sharp-tailed grouse dancing grounds were located in the Kirby study area (Table 99). The average attendance was 11.8 birds per ground. Ground number 13 was studied with the Prairie Dog Creek study area (Martin and DuBois 1980) but actually lies within the Kirby study area.

Table 99. Sharp-tailed grouse dancing grounds in the Kirby study area and number of males attending in 1980.

Ground Number	Location			Number of Males Observed 1980
	T	R	S	
1	6S	40E	21 NW $\frac{1}{4}$	14
2	6S	39E	23 NE $\frac{1}{4}$	3
3	6S	39E	35 NE $\frac{1}{4}$	10
4	6S	40E	31 NW $\frac{1}{4}$	11
5	7S	39E	2 SE $\frac{1}{4}$	14
6	7S	40E	8 NE $\frac{1}{4}$	7
7	7S	39E	12 SW $\frac{1}{4}$	13
8	7S	39E	15 SE $\frac{1}{4}$	14
9	7S	39E	26 NE $\frac{1}{4}$	16
10	7S	40E	19 SW $\frac{1}{4}$	7
11	7S	39E	36 SW $\frac{1}{4}$	16
12	7S	40E	32 NE $\frac{1}{4}$	18
13	7S	41E	3 NW $\frac{1}{4}$	10

Turkey

One group of 12 turkeys was observed on the study area in April. Most of the study area was too rugged and forested to easily detect the presence or absence of turkeys.

Ring-necked Pheasant

Pheasant crow counts were conducted along the Tongue River on 1 May and 2 May 1980. The route used began 1 mile south of the mouth of Hanging Woman Creek and included 15 stations located at 1 mile intervals in a southerly direction along the Tongue River road. Stations 1-7 were north of the Kirby study area and stations 8-15 were located within the study area.

Results were:

Date	Start time	Finish time	Weather		Crow Counts	
			Start	Finish	Total	Ave/Stop
5-1	0610	0723	Foggy	Clear	28	1.9
5-2	0610	0725	Foggy	Foggy	26	1.7

Waterfowl

The mallard was the only waterfowl species found breeding within the study area during 1980. Canada geese, American widgeon, blue-winged teal, and ring-necked ducks were observed as spring or late summer migrants.

Below average precipitation during the fall and winter of 1979 and during the spring of 1980 left most stock ponds on the area dry or with low water levels. No duck broods were observed on stock ponds in the study area. One brood of mallards was observed on the lower portion of Canyon Creek, approximately 1/2 mile from the Tongue River.

Songbirds and Raptors

Eighty species of birds, including game species, were observed on the study area (Table 100). The Cooper's hawk, golden eagle, osprey, prairie falcon, mountain bluebird, and Brewer's sparrow were listed by Flath (1979) as species of special interest or concern.

Table 101 lists the species composition and frequency of observation of the bird species observed during three runs of the road route. A total of 409 birds and 33 species were recorded. Western meadowlarks, chipping sparrow, and yellow warblers were the most common species observed.

Ten species of raptors, including owls, were observed on the study area. American kestrels were the most common raptor present. Three active red-tailed hawk nests were found on the study area. Another red-tailed hawk nest was found on the Tongue River near the study area. Several other pairs of red-tailed hawks were suspected to have nested on the study area. Two active prairie falcon aeries were found in the study area. A third pair was observed several times on another cliff during the spring, but apparently did not nest on that cliff. They may have nested on a nearby cliff or they may not have nested in the area. Several cliffs were not located until after the end of the nesting season and so were not surveyed for prairie falcon nests. No production data were obtained on any of the prairie falcon nests.

One Cooper's hawk was observed on the study area during June. Marsh hawks, turkey vultures, and great-horned owls were occasionally observed, and probably nested on the study area. One adult and one immature golden eagle were observed separately on the study area. The ospreys observed were probably those which nested on the Tongue River Reservoir. One migrating rough-legged hawk was seen in spring. A merlin was sighted about two miles north of the study area in April.

Table 100. Bird species observed on the Kirby study area.

1. Great blue heron	41. Black-billed magpie
2. Canada goose	42. Pinyon jay
3. Mallard	43. Clark's nutcracker
4. American wigeon	44. Black-capped chickadee
5. Ring-necked duck	45. White-breasted nuthatch
6. Turkey vulture	46. Red-breasted nuthatch
7. Cooper's hawk	47. House wren
8. Red-tailed hawk	48. Rock wren
9. Rough-legged hawk	49. Gray catbird
10. Golden eagle	50. Brown thrasher
11. Marsh hawk	51. American robin
12. Osprey	52. Mountain bluebird
13. Prairie falcon	53. Townsend's solitaire
14. American kestrel	54. Loggerhead shrike
15. Sharp-tailed grouse	55. Starling
16. Ring-necked pheasant	56. Solitary vireo
17. Turkey	57. Yellow warbler
18. Sora	58. Yellow-rumped warbler
19. Killdeer	59. Common yellowthroat
20. Common snipe	60. Yellow-breasted chat
21. Spotted sandpiper	61. Western meadowlark
22. Mourning dove	62. Red-winged blackbird
23. Great-horned owl	63. Northern oriole
24. Poor-will	64. Brewer's blackbird
25. Common flicker	65. Common grackle
26. Red-headed woodpecker	66. Brown-headed cowbird
27. Lewis' woodpecker	67. Western tanager
28. Hairy woodpecker	68. Black-headed grosbeak
29. Downy woodpecker	69. Lazuli bunting
30. Eastern kingbird	70. Indigo bunting
31. Western kingbird	71. Cassin's finch
32. Cassin's kingbird	72. American goldfinch
33. Say's phoebe	73. Red crossbill
34. Least flycatcher	74. Rufous-sided towhee
35. Western wood pewee	75. Lark bunting
36. Horned lark	76. Vesper sparrow
37. Violet-green swallow	77. Lark sparrow
38. Tree swallow	78. Dark-eyed junco
39. Barn swallow	79. Chipping sparrow
40. Cliff swallow	80. Brewer's sparrow

Table 101. Bird species composition and frequency from three census runs of the road route on the Kirby study area.

Species	Number Observed	Percent* Composition	Percent Frequency
Western meadowlark	84	21	67
Vesper sparrow	21	5	22
Chipping sparrow	44	11	47
Brewer's sparrow	11	3	12
Lark sparrow	21	5	28
Yellow-breasted chat	4	1	3
Rufous-sided towhee	29	7	37
American robin	14	3	20
Western wood pewee	14	3	15
Western kingbird	9	2	10
Eastern kingbird	10	2	10
House wren	27	7	30
Rock wren	18	4	25
Black-capped chickadee	1	+	2
Yellow warbler	36	9	37
Yellow-rumped warbler	9	2	12
Mountain bluebird	1	+	2
Lazuli bunting	1	+	2
Brown-headed cowbird	14	3	10
Red-winged blackbird	12	3	12
Brewer's blackbird	3	1	3
Common flicker	5	1	8
Northern oriole	5	1	5
Western tanager	1	+	2
Common grackle	1	+	2
Killdeer	1	+	2
Mourning dove	4	1	5
Gray catbird	1	+	2
Common snipe	1	+	2
Brown thrasher	2	+	3
Red-headed woodpecker	3	+	5
Kestrel	1	+	2
Say's phoebe	1	+	2

* + = less than 1%

Non-game Mammals

Eighteen species of mammals were observed on the Kirby study area (Table 102). Table 103 lists the results of small-mammal trapping. Traplines in grassland areas supported the highest trapping success. Riparian areas supported the lowest. Grassland areas also supported the most species. Deer mice were the most common mammal caught in all habitats.

Table 102. Mammals observed on the Kirby study area.

1. Raccoon	<i>Procyon lotor</i>
2. Striped skunk	<i>Mephitis mephitis</i>
3. Coyote	<i>Canis latrans</i>
4. Bobcat	<i>Lynx rufus</i>
5. Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
6. Least chipmunk	<i>Eutamias minimus</i>
7. Red squirrel	<i>Tamiasciurus hudsonicus</i>
8. Northern pocket gopher	<i>Thomomys talpoides</i>
9. Deer mouse	<i>Peromyscus maniculatus</i>
10. Northern grasshopper mouse	<i>Onychomys leucogaster</i>
11. Bushytail woodrat	<i>Neotoma cinerea</i>
12. House mouse	<i>Mus musculus</i>
13. Porcupine	<i>Erethizon dorsatum</i>
14. Desert cottontail	<i>Sylvilagus audubonii</i>
15. Mule deer	<i>Odocoileus hemionus</i>
16. Whitetail deer	<i>Odocoileus virginianus</i>
17. Pronghorn antelope	<i>Antilocapra americana</i>
18. Muskrat	<i>Onдатra zibethicus</i>

Table 103. Results of small-mammal trapping in the Kirby study area.

	Riparian	Ponderosa Pine-Juniper	Sagebrush	Grassland
Total captures	4	16	18	22
Trap nights	786	767	781	681
Captures/100 trap nights	0.5	2.1	2.3	3.2
Number of species caught	1	2	1	4
Species:				
<i>Peromyscus maniculatus</i>	4	15	18	14
<i>Eutamias minimus</i>		1		
<i>Onychomys leucogaster</i>				6
<i>Mus musculus</i>				1
<i>Spermophilus tridecemlineatus</i>				1

Tongue River DamMule Deer

Population characteristics: During April-August 171 mule deer were observed on the Tongue River Dam area. The average group size was highest in spring and lowest in summer (Table 79). Mule deer observations per hour of aerial survey were fairly low during May, June and July, and nearly doubled in August (Table 104).

Table 104. Mule deer and antelope aerial observations per hour in the Tongue River Dam area.

Month	Hours	Aerial Observ.		Observation /Hour	
		Mule Deer	Antelope	Mule Deer	Antelope
May	2.3	30	26	13.0	11.3
June	2.3	19	7	8.3	3.0
July	2.1	27	14	12.9	6.7
Aug	2.6	65	36	25.0	13.8
Summer	7.0	111	57	15.9	8.1

Use of vegetation: They mainly used grassland and sagebrush habitats in spring (Table 81). During summer they were observed in all habitats, but most were using riparian habitats.

Activity: Most of the deer were feeding when observed (Table 82).

Use of topography: The mule deer made heavy use of dissected mid-slopes, alluvium, and flood plains (Table 83). Use of flood plains greatly increased from spring to summer as the water level in the Tongue River Reservoir fell, exposing extensive mud flats. These mud flats soon became covered with forbs which were used by the mule deer.

Use of slope: Use of flat and gentle slopes was high during both seasons (Table 84). This was probably due to the distribution of most of the mule deer near the Tongue River Reservoir where the topography was less rugged.

Use of exposure: Most of the deer observed were on flat or gentle slopes where exposure was not important, so trends were hard to observe. The mule deer observed on slopes seemed to use all exposures fairly evenly (Table 85).

Whitetail Deer

Eleven whitetail deer were observed on the study area during the spring and summer. Most were observed feeding in riparian habitat or hayfields along the Tongue River.

Antelope

Population characteristics: During the spring and summer 102 antelope were observed on the study area. The average group size was highest in spring and lowest in summer (Table 86). Aerial observations per hour were lowest in June and increased in July and August (Table 104). Fawn production was fairly good at 88.9 fawns/100 does in July and 85.7 fawns/100 does in August (Table 105).

Table 105. Antelope population characteristics in the Tongue River Dam area.

Month	Number Classified				Fawns:100		Bucks: 100 Does	Population Structure (%)		
	Total	Bucks	Does	Fawns	Does	Adults		Bucks	Does	Fawns
June	5	1	4	0	0	0	25.0	20.0	80.0	0
July	18	1	9	8	88.9	44.4	11.1	5.6	50.0	44.4
Aug.	36	10	14	12	35.7	33.3	71.4	27.8	38.9	33.3

Use of vegetation: Nearly all antelope were observed in sagebrush or grassland habitat (Table 94).

Activity: Most of the antelope were running when observed (Table 95).

Use of topography: Most of the antelope in spring were using alluvium along Deer Creek near the Tongue River Reservoir (Table 96). Most were seen on dissected mid-slopes during summer.

Use of slope: Most of the antelope were seen on flat slopes in the spring and medium slopes in the summer (Table 97).

Use of exposure: Most of the antelope were seen on flat or gentle slopes where exposure was not important. Those antelope seen on slopes tended to use all exposures fairly evenly (Table 98).

Upland Game Birds

One group of five sage grouse was observed on the study area in August. No strutting grounds are known to occur in the study area.

Ring-necked pheasants occurred along the Tongue River in areas with sufficient cover.

Turkeys were observed once in the study area. A group of two hens and eight young were seen near the northeast shore of the Tongue River Reservoir.

Waterfowl

Waterfowl species found breeding within the study area during 1980 included mallards and Canada geese. Gadwalls, pintails, green-winged teal, blue-winged teal, cinnamon teal, American widgeon, northern shovelers, wood ducks, ring-necked ducks, lesser scaup, buffleheads, ruddy ducks, and common mergansers

were observed as spring or late summer migrants. The Tongue River Reservoir was used extensively by ducks and geese during spring and fall and appears to be an important stop-over area during migration.

Songbirds and Raptors

Ninety-four species of birds were observed on the Tongue River Dam area (Table 106). The goshawk, golden eagle, bald eagle, osprey, prairie falcon, peregrine falcon, mountain bluebird, and Brewer's sparrow were listed by Flath (1979) as species of special interest or concern.

Table 107 lists the species composition and frequency of observation of the bird species observed during three runs of the road route. A total of 407 birds and 39 species was recorded. Western meadowlarks, red-winged blackbirds, and chipping sparrows were the three most common species.

Thirteen species of raptors, including owls, were found on the study area. American kestrels were the most common raptor on the area. Red-tailed hawks were also common on the area. One active red-tailed hawk nest was found and several other pairs were suspected to have nested on the study area. Four golden eagle nests were located on or near the study area. At least one pair of adult eagles was present, but they did not appear to have nested during 1980.

A pair of ospreys initiated a nest at the southern end of the reservoir, but abandoned the nest during incubation. They remained in the area for the entire summer.

Turkey vultures, marsh hawks, Swainson's hawks, and prairie falcons were present during the breeding season and probably nested in or near the study area. One goshawk was seen on the study area in spring. It could have been either a migrant or breeding in the area. Several bald eagles and one peregrine falcon were observed in May. They were all migrating birds. Great-horned owls and short-eared owls were observed on the area and probably nested there.

Non-game Mammals

Seventeen species of mammals were observed on the study area (Table 108). Table 109 lists the results of small mammal trapping. Ponderosa pine-juniper habitat supported the highest trapping success. The lowest trapping success was in riparian habitat. Deer mice were the most common species caught in all habitats.

Table 106. Bird species observed on the Tongue River Dam area.

1. Eared grebe	48. Common flicker
2. Eastern grebe	49. Eastern kingbird
3. Pied-billed grebe	50. Western kingbird
4. White pelican	51. Cassin's kingbird
5. Double-breasted cormorant	52. Say's phoebe
6. Great blue heron	53. Least flycatcher
7. Canada goose	54. Western wood pewee
8. Mallard	55. Violet-green swallow
9. Gadwall	56. Tree swallow
10. Pintail	57. Bank swallow
11. Green-winged teal	58. Barn swallow
12. Blue-winged teal	59. Cliff swallow
13. Cinnamon teal	60. Black -billed magpie
14. American widgeon	61. Pinyon jay
15. Northern shoveler	62. Clark's nutcracker
16. Wood duck	63. Black-capped chickadee
17. Redhead	64. House wren
18. Lesser scaup	65. Rock wren
19. Bufflehead	66. Gray catbird
20. Ruddy duck	67. Brown thrasher
21. Turkey vulture	68. American robin
22. Goshawk	69. Mountain bluebird
23. Red-tailed hawk	70. Cedar waxwing
24. Swainson's hawk	71. Starling
25. Golden eagle	72. Yellow warbler
26. Bald eagle	73. Yellow-rumped warbler
27. Marsh hawk	74. Common yellowthroat
28. Osprey	75. Western meadowlark
29. Prairie falcon	76. Red-winged blackbird
30. Peregrine falcon	77. Northern oriole
31. American kestrel	78. Brewer's blackbird
32. Sage grouse	79. Common grackle
33. Ring-necked pheasant	80. Brown-headed cowbird
34. Turkey	81. Black-headed grosbeak
35. American coot	82. Lazuli bunting
36. Killdeer	83. Indigo bunting
37. Spotted sandpiper	84. American goldfinch
38. Solitary sandpiper	85. Red crossbill
39. Lesser yellowlegs	86. Rufous-sided towhee
40. Semipalmated sandpiper	87. Lark bunting
41. Wilson's phalarope	88. Vesper sparrow
42. Ring-billed gall	89. Lark sparrow
43. Black tern	90. Chipping sparrow
44. Mourning dove	91. Brewer's sparrow
45. Great-horned owl	92. White-crowned sparrow
46. Short-eared owl	93. Song sparrow
47. Belted kingfisher	94. Common merganser

Table 107. Bird species composition and frequency from three census runs of the road route on the Tongue River Dam area.

Species	Number Observed	Percent Composition	* Percent Frequency
Western meadowlark	95	23	82
Vesper sparrow	5	1	8
Chipping sparrow	30	7	33
Brewer's sparrow	4	1	7
Lark sparrow	18	4	22
White-crowned sparrow	1	+	2
Lark bunting	3	1	3
Rufous-sided towhee	11	3	15
American robin	13	3	13
Western wood pewee	4	1	7
Western kingbird	14	3	13
Eastern kingbird	8	2	8
Cassin's kingbird	4	1	3
House wren	13	3	12
Rock wren	10	2	13
Black-capped chickadee	3	1	5
Yellow warbler	22	5	20
Yellow-rumped warbler	2	+	3
Lazuli bunting	1	+	2
Indigo bunting	1	+	2
Cedar waxwing	1	+	2
Brown-headed cowbird	7	2	8
Red-winged blackbird	55	14	37
Brewer's blackbird	20	5	17
Common grackle	10	2	10
Common flicker	3	1	5
Northern oriole	8	2	10
Say's phoebe	1	+	2
Least flycatcher	2	+	3
Killdeer	7	2	8
Kestrel	1	+	2
Brown thrasher	1	+	2
Spotted sandpiper	2	+	2
Tree swallow	11	3	5
Mourning dove	7	2	8
Black-billed magpie	5	1	7
Starling	1	+	2
Common yellowthroat	1	+	2
Pinyon jay	2	+	2

* + = less than 1%

Table 108. Mammals observed on the Tongue River Dam area.

1. Raccoon	<i>Procyon lotor</i>
2. Striped skunk	<i>Mephitis mephitis</i>
3. Coyote	<i>Canis latrans</i>
4. Red fox	<i>Vulpes vulpes</i>
5. Yellowbelly marmot	<i>Marmota flaviventris</i>
6. Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
7. Least chipmunk	<i>Eutamias minimus</i>
8. Red squirrel	<i>Tamiasciurus hudsonicus</i>
9. Northern pocket gopher	<i>Thomomys talpoides</i>
10. Deer mouse	<i>Peromyscus maniculatus</i>
11. Bushytail woodrat	<i>Neotoma cinerea</i>
12. Muskrat	<i>Ondatra zibethicus</i>
13. Porcupine	<i>Erethizon dorsatum</i>
14. Desert cottontail	<i>Sylvilagus audubonii</i>
15. Mule deer	<i>Odocoileus hemionus</i>
16. White-tailed deer	<i>Odocoileus virginianus</i>
17. Pronghorn antelope	<i>Antilocapra americana</i>

Table 109. Results of small mammal trapping in the Tongue River Dam area.

	Riparian	Ponderosa Pine-juniper	Sagebrush	Cliff area
Total captures	7	28	19	22
Trap nights	630	812	745	820
Captures/100 trap nights	1.1	3.4	2.6	2.7
Number of species caught	1	2	1	1
Species:				
<i>Peromyscus maniculatus</i>	7	27	19	22
<i>Eutamias minimus</i>		1		

Literature Cited

- American Ornithologist's Union. 1957. Checklist of North American Birds. 5th Ed. American Ornithologist's Union, Ithaca, New York. 691 pp.
- _____. 1973. 32nd supplement to the American Ornithologist's Union checklist of North American Birds. Auk. 90(2):411-419.
- _____. 1976. 33rd supplement to the American Ornithologist's Union checklist of North American Birds. Auk. 93(4):875-879.
- Call, M.W. 1978. Nesting habitats and surveying techniques for common western raptors. Tech. Note No. TN-316. U.S. Bureau of Land Management. Denver Service Center, Denver, Colorado. 115 pp.
- Flath, D.L. 1979. Non-game species of special interest or concern. Wildlife Division, Mont. Fish and Game. 73 pp.
- Henderson, F.R., D.F. Springer and R. Adrian. 1974. The black-footed ferret in South Dakota. South Dakota Dept. of Game, Fish and Parks. Tech. Bull. No. 4. 37 pp.
- Hoffman, R.S. and D.L. Pattie. 1968. A guide to Montana mammals: identification, habitat, distribution and abundance. Univ. Mont. Print Service. 133 pp.
- Kimball, J.W. 1949. The crowing count pheasant census. J.W.M. 13(1):101-120.
- Martin, P.R. 1978. Black-footed ferret inventory and management development plan for southeastern Montana. Mont. Dept. of Fish and Game and U.S. Fish and Wildlife Service. Rept. 31 pp.
- Martin, P.R. and K. DuBois. 1980. Southeast Montana wildlife study. Mont. Dept. of Fish, Wildlife and Parks and U.S. Bureau of Land Management progress report. 47 pp.
- Skaar, P.D. 1980. Montana bird distribution - mapping by latilong. 2nd Ed. P.D. Skaar, 501 S. Third, Bozeman, MT. 66 pp.
- Stebbins, R.C. 1966. A field guide to western reptiles and amphibians. Houghton, Mifflin Co., Boston. 279 pp.
- United States Department of the Interior (U.S.D.I.). 1979. Unsuitability criterion 14 guidelines for the Powder River coal production region. Inst. Memo. No. 80-126. 2 pp.

22

22